# Products Finishing

FRED W. VOGEL, Editor

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# Products Finishing

ALONG about this time each year, many manufacturers begin to make preparations for a change in model of their products for the following year's market. From automobiles to the many labor saving devices in the modern home such as laundry equipment, mechanical refrigerators, bathroom fixtures, vacuum sweepers, kitchen ranges, heating equipment, and so on, the changeover this year will be more important than ever before. Lack of vital materials and the necessity for building those things which will strengthen our National Defense now threaten curtailment in production on some of these items from a possible minimum of twenty per cent to a point where manufacturing will be suspended entirely.

Obviously, this condition will bring additional problems that cannot be avoided. In the finishing department, it will mean preparation for handling different kinds of work fabricated from substitute materials. New methods of holding workpieces must be devised. An increase or decrease in size of part will mean either larger or smaller tank or oven capacity. A number of tried and tested new finishing processes undoubtedly will be placed in operation. And these, of course, will require careful study and close observation for successful operation at peak efficiency.

When the necessary adjustments have been made, production will be even greater than anticipated and again the American worker will have achieved the production for which he is characteristically known.

**AUGUST, 1941** **Vol. 5, No. 11**

The "Green Diamond," recently repainted in the Burnside shops.

# Refinishing from R

***Experience has shown that thorough maintenance of fast moving trains is of inestimable value during times of increased industrial activity.***

By J. F. MONGER

Car Shop Superintendent, Illinois Central System

STRETCHING along the Illinois Central's right of way at 95th Street on Chicago's far south side is an expensive acreage accommodating the many buildings of the company's Burnside shops. Here, in a building some 200 ft. wide and twice as long, is handled the repainting of all coaches of the Illinois Central System brought to Burnside for general repairs.

A steady stream of cars in various stages of painting and finishing may be seen passing along on the 16 tracks running the width of the building. An average of 12 general repair cars and six multiple-unit suburban cars are handled in this paint shop each month. The multiple-unit, or M. U. cars as they are commonly called, are in pairs—a motor car and trailer—the I. C. suburban lines being electrified.

Cars brought to the Burnside shops for overhauling and repair pass through a receiving room where all upholstery and seats, baggage racks, lighting fixtures, window shades, and other appurtenances, are removed. The car is then shunted across an areaway to the truck shop where the trucks are removed. Mounted on dummy trucks, the stripped car is now ready for the showers. Traveling down the full length of the paint shop it is run onto the wash track at the extreme south end of the building, where it is first given a thorough inspection to determine the condition of the old paint surface. If the paint is in fair condition, the car is washed inside and out. If, however, the outside surface shows the need of special treatment, only the inside is washed, after which the car is sent to the sand blast for the removal of the exterior paint.

From the sand blast or the wash track, as the case may be, the car is

# nishing Rolling Stock from Rails to Roof

taken to the passenger car shop, where all general repair work is done, after which it goes back to the truck shop for truck replacement, the trucks in the meantime having been overhauled and then given two coats of truck enamel. The car now traveling on its own trucks is then returned to the paint shop shown in Fig. 1. Here a crew starts to work on the inside of the car, where they knife glaze all pits, holes, and bruises in the side walls and bulkhead ends. This knife glazing is then well sanded.

The painting of the interior of the coaches as shown in Fig. 2, may be divided into three distinct operations involving the base, side walls, and ceiling. In the first operation the base pipes and pipe - guards are sprayed with two coats of color in synethetic enamel. The painted part is then masked and ready for the second operation—the spraying of the side walls with synthetic enamel in a different color from the base. Both the first and second operations are completed in one day.

The next morning the side walls are masked and the ceiling is sprayed two coats of ceiling color in synthetic enamel. In all of these two-coat jobs one light coat is applied followed about an hour later by the second or finish coat of the same material, giving a much better finish than if a longer drying period were allowed between the coats. After the ceiling has received its final coat all

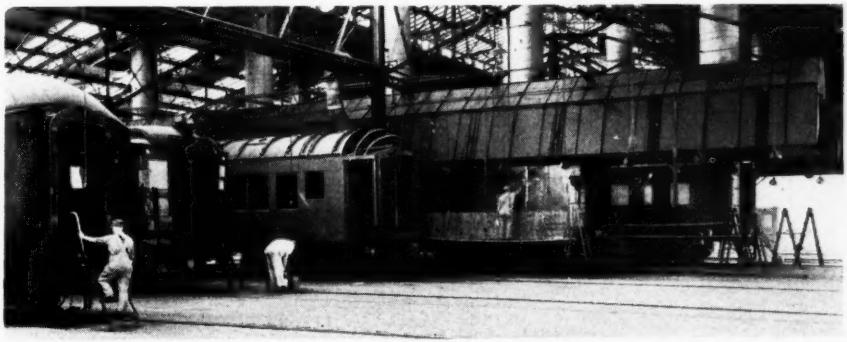

Fig. 1—A view showing one end of the paint shop at Burnside, with several track canopies located in the rear.

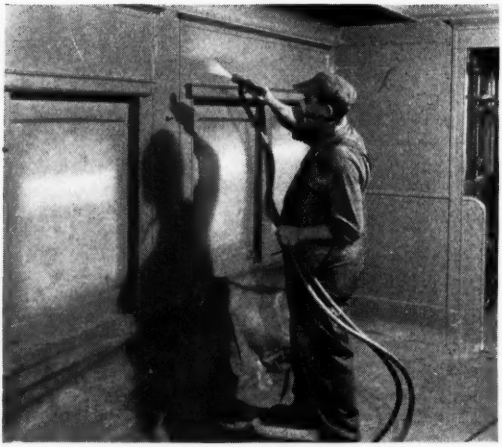

Fig. 2—Touching-up the interior of a dining car.

masking is removed and hand brushing is done around the windows and window stops.

While work is being done on the inside of the car, equal activity is in progress on the outside as shown in Fig. 3. If the job is of a repair nature in which the exterior surface was not sand blasted, the outside of the car is slightly sanded and all pitted and bare spots are knife glazed and sanded, after which the sides are sprayed with a coating of glazing composition and allowed to dry overnight. The next day two coats of P X surfacer are sprayed on the car sides, followed by a spraying of two coats of Pullman green Duco; the windows are cleaned and the lettering stenciled the same day.

If the car is an exterior sanded job, it is sprayed with one coat of red-oxide steel primer on coming from the sand blast, after which it goes through the shop for needed repairs, whereupon it is returned to the paint shop building where it receives a coating of glazing composition, followed by two coats of P X surfacer and Duco.

The roofs and bottoms of all coaches receive the same treatment —a spraying of one coat of No-Krode compound, followed, after an overnight drying, by two coats of Number One black roof paint.

Two of the 16 tracks running the width of the paint shop building are equipped with overhead canopies with one open track between. Cars

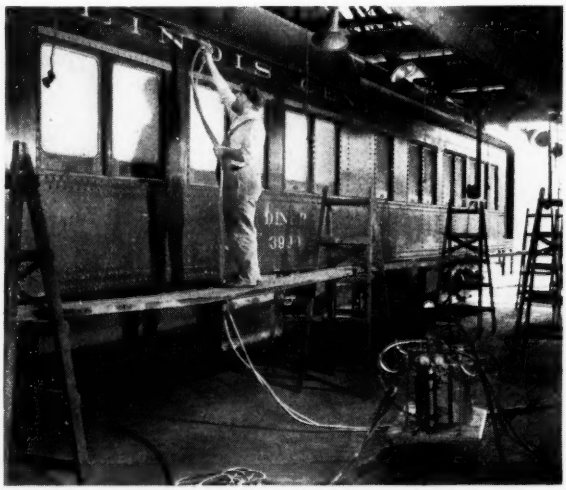

Fig. 3—Spray-painting exterior of a dining car. Portable spraying equipment, mounted on four-wheeled rubber-tired floor truck is shown in the right foreground.

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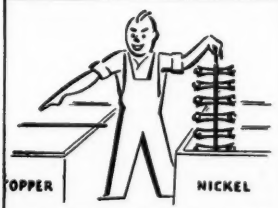
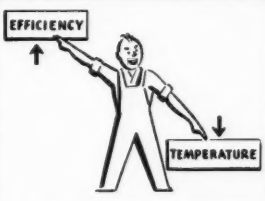
**2** The plate buffs easily, with minimum pressure—is often used without buffing prior to bright nickel plating.

**3** Makes possible savings in time, labor, buffing materials and the amount of copper removed.




**4** Deposit remains "active" and requires no special treatment for subsequent plating.

**5** Bath constituents are non-corrosive and completely controllable. Contains no cyanide, requires no special addition agents, brighteners, etc.




**6** Operates at moderate temperatures, has excellent throwing power and 100% efficiency.

As a result of the severe shortage of nickel, copper is being utilized to replace a large part of the nickel formerly used in decorative plating. Also, heavier thicknesses of copper are specified to conserve nickel in industrial and defense applications.

The fact that Unichrome* Alkaline Copper Process is made available now—when it can be a valuable aid in meeting this situation, is a fortunate circumstance. The fulfillment of years of research at our Waterbury Laboratories—supplemented by plant tests and trials—comes at a time when this process can be of greatest help to the industry.

Six of the time- and labor-saving advantages which Unichrome* Alkaline Copper offers are summarized above. It makes possible other savings in operation and materials that you will want to investigate. A letter to any office listed below, giving a brief outline of your requirements, will bring a prompt response.

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Fig. 4 — Cleaning coal cars which are lined up in the outside paint yard.

finished on this open track receive the benefit of the canopies on each side. Each of the canopies has five exhaust stacks extending through the roof, each stack having a 42-in. suction fan to aid in carrying off the paint fumes. Two blower fans supply a stream of air through floor vents running along the sides of each of the tracks which serve the canopy stations. At a separate spray booth in one of the shops, one operator is engaged in refinishing all baggage racks, lamps, trimmings, and other removable fixtures.

Portable spray-painting equipment is used exclusively at the Burnside shops, a whole battery of these units being kept cleaned and ready, in an adjacent fireproof stockroom, for immediate service, each being a small four-wheeled, rubber-tired floor truck with a 5-gal. pressure feed paint tank, two lengths of air hose and two lengths of material hose, each 60 feet long. There are separate units for the different purposes. For instance, there are those to be used for painting the ceilings of cars, others for side walls, for floors, outside of cars, roofs, and so on. When a workman wants a certain unit for a certain purpose, he notifies the stockroom and the required unit is brought to the workman with tank filled and guns ready for use. The compressed air is supplied from a central air compressor to eight air connections which supply the three tracks where the spraying is done—the two tracks under the canopies and the one between. Pressure between 90 and 100 pounds is maintained.

Fig. 5—Final operation—stenciling the lettering on a hopper bottom car while the car is on a paint yard siding.

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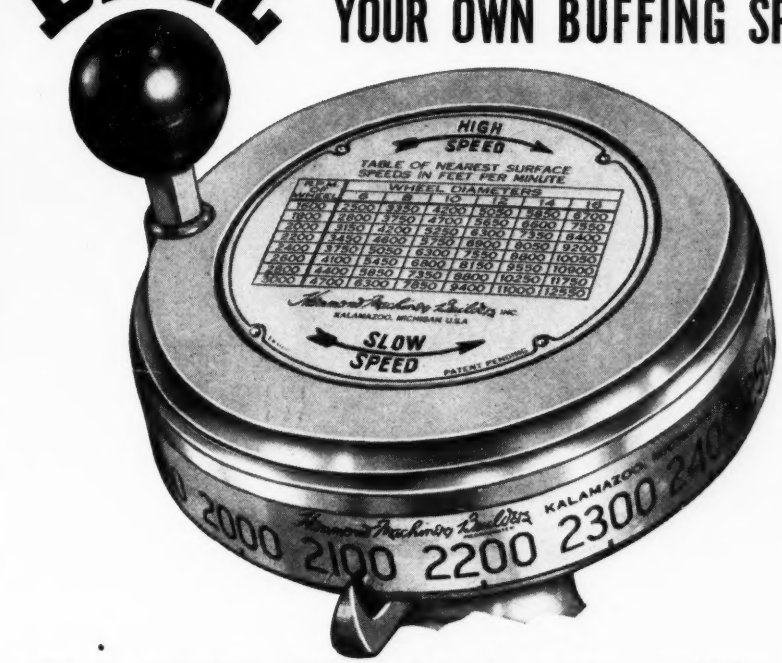


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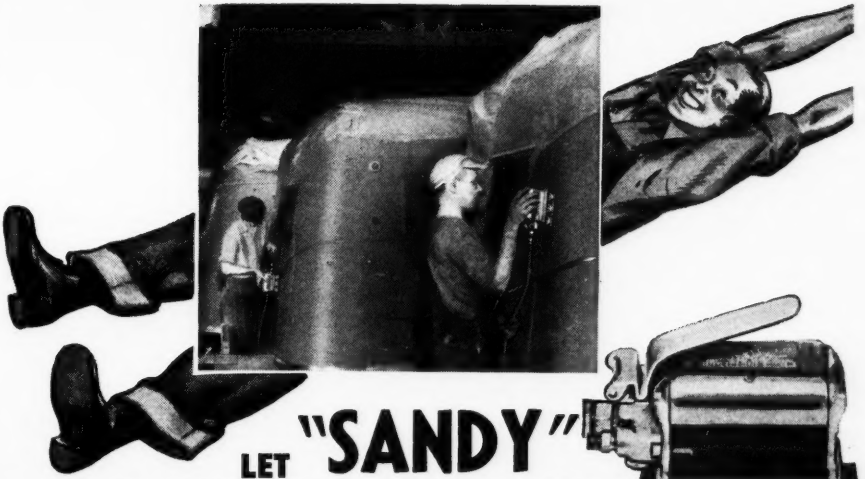
As soon as a workman is through with one unit, he notifies the stockroom and a man is sent out to the paint shop floor to get it, taking it back to the stockroom, where it is cleaned immediately and made ready for the next user. In this way there never is any unnecessary littering of the floor space around the car being painted. Smaller units are also used—2-gal. tanks and cup guns—for certain work inside of cars, particularly for staterooms, washrooms, and other close quarters.

Not only are the coaches and suburban trains finished in the Burnside shops, but recently the Green Diamond, one of the first Diesel-electric streamliners going out of Chicago, running between Chicago and St. Louis, was completely repainted in the Burnside shops. In keeping with the present tendency toward exterior attractiveness of streamline trains running across the country, the Illinois Central is staying abreast, as indicated by the striking appearance of the company's latest streamliner, the City of Miami—Diesel powered and fabricated as a single unit—in its unusual color scheme of orange, green, and scarlet, suggested by Florida's blue skies, blue-green waters, and yellow fruits; together with the greens of its foliage and the sand tones of its beaches.

Fig. 6—The green wave which divides over the nose of the "City of Miami," the Illinois Central's new streamliner, gives the impression of a speed boat splitting the waves of southern waters.

### Freight Cars and Cabooses

Other rolling stock, such as coal cars, box cars, cabooses, refrigerator cars, and so on, are cleaned and repainted at other points on the line—Centralia, Illinois, Memphis, Tennessee, and McComb, Mississippi. At all of these points, spraying, cleaning, stenciling, and so on, is done in an outside paint yard as shown in Figs. 4 and 5. Locomotives and



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tenders are painted both by spraying and brushing at Paducah, Kentucky, while supplemental or repair painting of locomotives is done at several of the division points. Coal cars are painted black; box cars and cabooses are red; refrigerator cars, yellow; and express refrigerator cars, green. Locomotives and tenders are black.

These units, like the coaches at the Burnside shops, pass through a regular routine operation: After inspection of cars, they are sand blasted, if necessary; then a filler or base coat of No-Krode primer is given. If, after this imperfections show up, they are corrected, and two coats of paint are sprayed All lettering is stenciled on as a final operation. By this method the normal daily output of each car repair plant is from ten to 25 rebuilt and repainted cars.

# Practical Application of Finishing Material

EXPERIMENTS conducted by the Condensation Engineering Corporation, Chicago, Ill., shows that when porcelain enameled flue pipe is well insulated, it can be used as a complete outlet or vent pipe for residential and small commercial space and water heating installations. A chimney of this type requires only about an hour to install complete. In the low-cost housing field it effects an important reduction in the over-all cost of the building. This is especially true when gas or oil-fired units are used. Here the only chimney necessary is from the unit upward.

Insulated porcelain enameled pipe with Fyrex insulation is known commercially as "Vitroliner Vent Pipe." It consists of sections of vitreous enameled pipe and fittings insulated with a high-temperature, pre-fabricated asbestos wall one inch thick. The outer surface is coated with refractory cement. The cylindrical tube insulation is held together with metal bands. It is required only where the pipe is to be used as a self-contained chimney, or where sections of it are adjacent to combustible materials. It has the approval of the National Board of Fire Underwriters, where gas is used as a fuel. Their only requirement is a one-inch clearance from combustible materials.

Vitroliner pipe has been used for

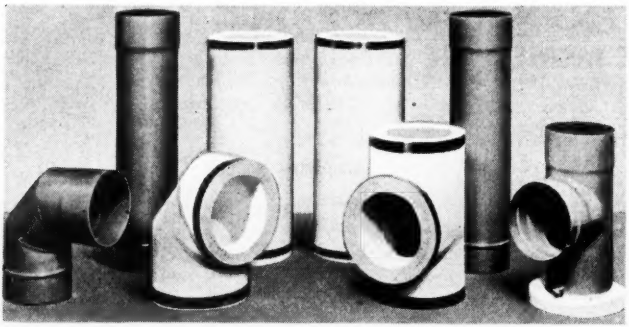

Fig. 1 — When completely insulated with the high-temperature asbestos tubes shown here, Vitroliner — porcelain enameled vent pipe — can be used as complete outlet or vent piping.

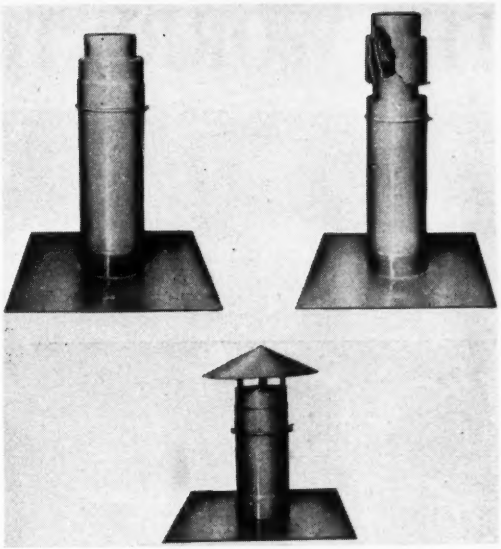

Fig. 2—Above: These new Vitroliner roof vents make it possible to do a complete job of venting. Roof flange and top joints are welded. Below: This roof vent is recommended where a wind or rain cap is desired. All roof vents can be designed for pitched roofs.

•

many years as a new or replacement lining for standard chimneys. In addition to the thousands of private installations, it has been used on government housing projects. Vitroliner pipe is made from heavy-gauge Armco Ingot Iron in 6, 12, and 24-inch lengths. Bell and spigot-type joints insure a uniformly tight fit. Diameters range from 3 in. to 10 in. All seams are welded after which the pipe is finished in acid-resisting porcelain enamel. This offers a continuous smooth surface to the passage of flue gases and reduces to a minimum the frictional resistance prevalent in unlined chimneys. The acid-resisting porcelain enamel was developed especially to meet the hazards of the products of combustion. The colors available are green and brown.

Besides eliminating possible damage from flue gas condensation, porcelain enameled flue liners result in fuel savings. Actual tests, it is said, have resulted in savings of 10 or 15 per cent in some cases. These savings were due to the lowered cross-sectional area which restricted the amount of air going up the chimney and reduced the amount of air infiltration.

Vitroliner pipe and fittings are fabricated and enameled by the Ingram-Richardson Manufacturing Company, Frankfort, Ind., and distributed by the Condensation Engineering Corporation, Chicago, Illinois.

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**Unichrome Alkaline Copper.** To describe the new Unichrome Alkaline Copper Plating Process and explain how it can be a valuable aid in meeting the demand for improved copper plating, created by priority metal shortages, United Chromium, Incorporated, 51 E. 42nd St., New York, N. Y., recently issued an informative leaflet outlining the plating bath, operating cycle and equipment used, as well as the time and labor saving features which this process offers, such as: smooth, fine-grained deposits can be plated to thicknesses of .001 in. or more. Unichrome Alkaline Copper buffs easily, with minimum pressure and is often used without buffing prior to bright nickel plating. No special cleaning or activation is required for subsequent plating. Bath operates at moderate temperatures, is non-corrosive and easy to control.

A copy of this leaflet will be sent free upon request.

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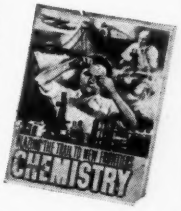


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# Modern Gold Plating

By JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

IN establishing control of the gold plating operation, it is a good plan to make a flow sheet of the gold in and out of the plating room. Such a flow sheet is shown for a typical heavy gold plating operation in Figure 50 and for a flash or light gold plating operation in Figure 51.

Taking the heavy gold plating flow sheet, which is more complicated, we start with gold purchased in metal or salt form from the refiner. It is converted to stock solution and then goes into the plating tank. From the plating tank gold leaves in three ways: it goes out on the work as deposited metal; it goes out on the racks or wires as waste plate and it goes out with the electrolyte as carryover or dragout.

The plated object carrying most of the gold now goes to the polishing room where it is buffed or tumbled and from there it goes back to the plating room to be flashed with the proper gold color. At the flashing tank gold also goes out in the same three ways as it did at the heavy plating tank; that is, on the work, on the racks and by dragout. All recovered or reclaimed metal such as recovery rinse water, rack strippings and polshing sweeps, goes back to the refiner for credit. This is a complete heavy gold plating cycle.

In flash or light gold plating, the gold goes from stock solution into the plating tank and out the same three ways, no further steps being taken.

Incidentally, we might note that it has been tacitly assumed that insoluble anodes are being used in the gold plating tanks. Gold anodes dissolve both electrochemically and chemically in the cyanide bath and for this reason baths containing soluble anodes are not amenable to control of the type discussed in this article.

### The Gold Stock Solution

Control of the gold plating operation starts at the stock solution. Before being placed in operation, the gold, whether purchased in salt or metallic form, should be converted into a form that is easily and conveniently measurable. For this purpose, the liquid state is best and, therefore, a known amount of gold should be dissolved in a known amount of liquid to give a solution whose unit concentration is convenient for measurement. Thus if we have G ounces (troy) of gold as metal and

# g—Part 12

dissolve it in W gallons of water our concentration of gold in the solution is G/W ounces per gallon.

A number of platers cut down their gold by dissolving in aqua regia and precipitating this with ammonia or sodium carbonate to form the fulminate or other basic compounds. They wash the precipitate with water, then drain most of it off, leaving the precipitate wet, covered with a slight layer of water to prevent it from drying out and exploding. Whenever they want to make up a gold plating bath or make some replenishments to a gold plating bath already in operation, they scoop up a little of the muddy yellow brown precipitate and dump it into their cyanide solution to dissolve.

That this is a poor method for handling the gold seems obvious, for in making replenishments or in starting a new bath, since neither the weight nor the volume of the amount of gold taken out is known, the plater knows how much gold he had to start with (provided none was lost in the process of cutting down), but he does not know how much he is adding to the bath at any given time.

The best procedure is to completely dissolve the known weight of gold either in fulminate or other salt form, in a known volume of water

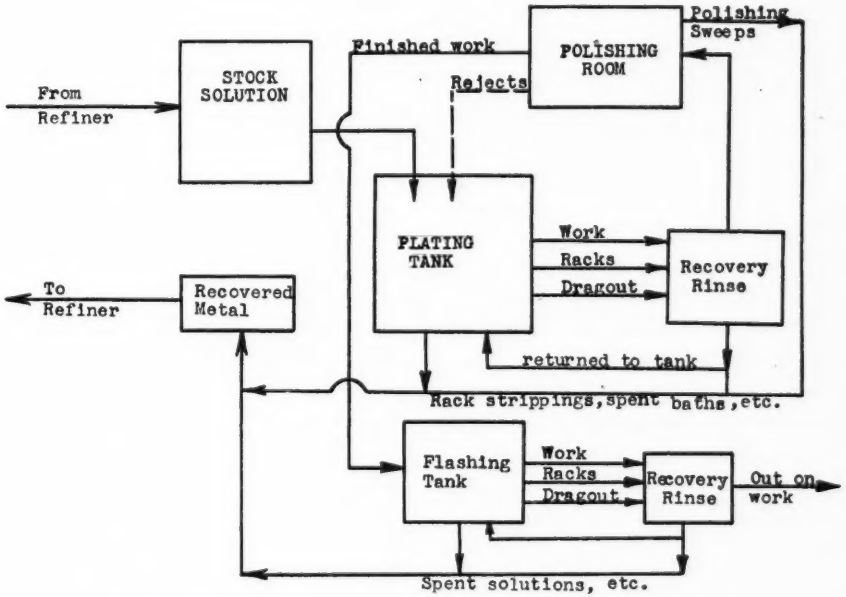



Fig. 50—Flow sheet of heavy gold plating operations in the plating shop

containing sufficient cyanide to complete the dissolution. As suggested in an earlier paragraph, a convenient concentration of gold should be used so as to simplify accurate measurement of the gold. Thus, for example, if you purchase your gold as pure potassium gold cyanide, you will find that you can dissolve at room temperature a sufficient amount of this compound to give you a solution containing 2 oz. of fine gold per gallon, without any danger of crystallization, provided that a little free cyanide is present.

The actual dissolving is best done by dissolving the gold salt in a little less than the required amount of water, then adding water to the exact mark in a previously calibrated stock bottle. With a concentration of 2 oz. of gold per gallon we know that every fluid ounce of the stock solution contains .312 dwt. of gold. This is, however, a rather clumsy figure to deal with and we recommend for all around convenience dissolving the equivalent of 1.28 ounces per gallon of fine gold, which gives the much more convenient concentration of .2 dwt. per fluid oz. of solution. Of course, if the gram-liter system is used, which is even better, a concentration of 10 or 20 grams of gold per liter is quite satisfactory for simplicity in measurement.

For dispensing dissolved gold from the stock bottle both quickly and accurately without any spillage loss, either one of the two arrangements illustrated in Figures 52 and 53, are possible.

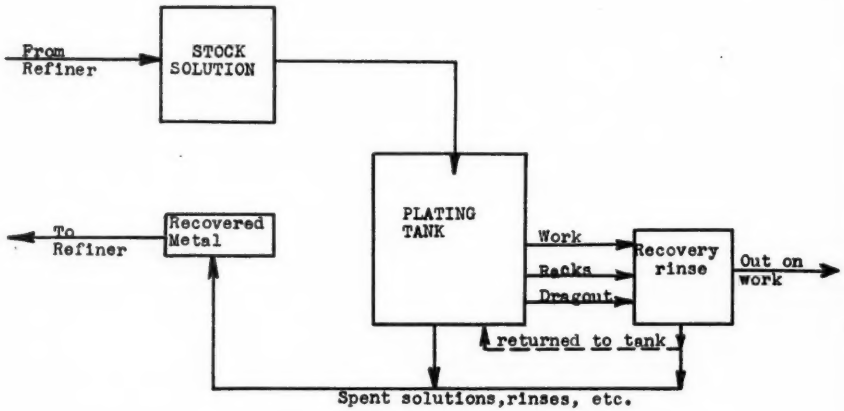
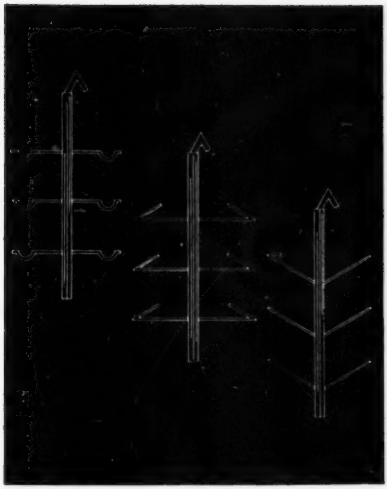



Fig. 51—Flow sheet of flash gold plating operations in the plating shop

The first is a syphon arrangement consisting of a two-holed rubber stopper, a short piece of bent glass tubing and a long piece that fits down to the bottom of the bottle, a long piece of pure rubber tubing and glass nozzle and a pinch clamp. The stock bottle can be place on a convenient shelf, out of harm way. Under the outlet should be kept a small glass tray to catch any drip and to house the graduate during the process of dispensing the gold solution.

The problem of starting the syphon is very easily solved by attaching a piece of clean rubber hose to the short glass tubing and blowing into it after having first taken the pre-



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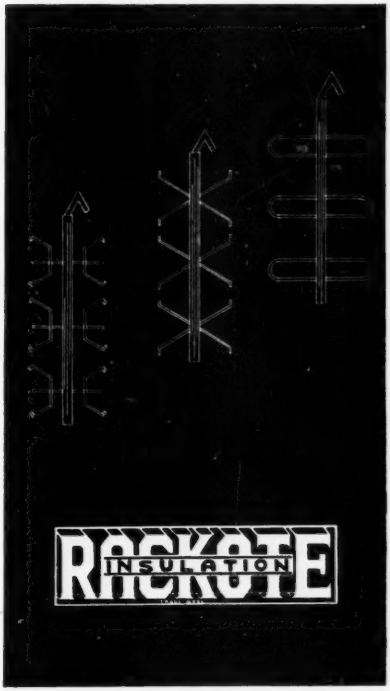


RACKOTE is a combination of lacquer and acid- and alkali-resisting plastics.

RACKOTE is easily applied by dipping and air-dries quickly. No taping is required.

RACKOTE prevents seepage between rack and insulation, and saves current and anodes. A thin film will endure long plating cycles.

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caution of opening the pinch clamp, the syphon will not start unless you do this since the back pressure of the air trapped in the long glass column will force the liquid right back into the bottle again. The moment the solution starts to flow out of the glass tip, shut the pinch clamp and remove the extra piece of rubber hose from the short glass tubing. The outfit is now ready for use.

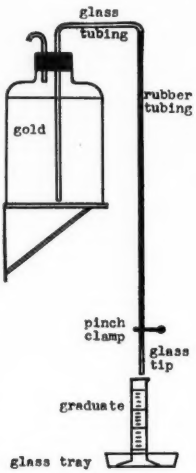



Fig. 52 — Illustration showing a drawing of a gold stock solution dispenser of the syphon system type

The second method for dispensing the gold is based on a pressure principle. For this is needed the same rubber stopper with two holes and the two pieces of bent glass tubing, one short, one long, plus a rubber pressure bulb, with valve, and a glass T joint. The stock bottle may be kept conveniently on a table or bench. To operate, the cork is securely fitted into the bottle and the thumb is pressed tightly over the open end of the T joint while the rest of the hand is used to squeeze the rubber bulb. The squeezing is continued until the proper amount of gold is forced into the graduate. At a point in the operation that is best determined by experience, the squeezing is stopped and the thumb lifted from the T joint whereupon the excess liquid in the glass column runs back into the stock bottle due to the momentary release of pressure. As with system number one, a glass tray should be placed to catch any drip and hold the graduate when measuring the gold solution.

The stock solution, once prepared, should be labeled with an indentifying number and ticketed as follows:

**Gold Stock Record**

Stock bottle number.....
Date prepared .....
By.....
Volume.... Gold concentration.....
Total gold content.....

A record containing all this data and data on use and removal of stock solution should also be kept. A form that suggests itself for this purpose is the following one:

**Gold Removal Record**

Stock Bottle Number.....
Date Removed..... By.....
Volume taken.....Total weight of gold..... Remarks.....
For tank No.....On run No.....
With lot No.....

This completes control of the gold at the stock solution.

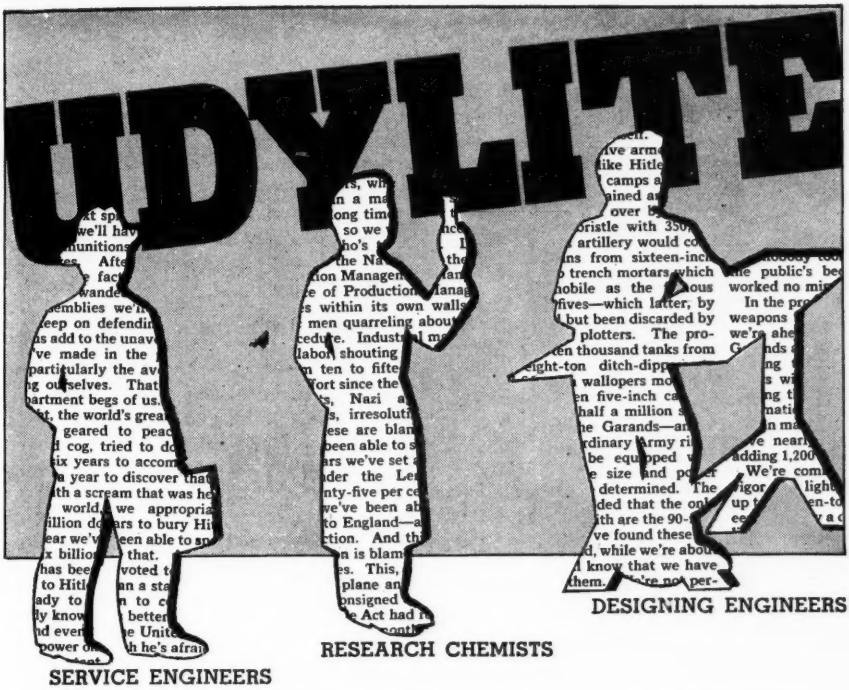
**Gold Control at the Tanks**

The gold that is put into the plating tank leaves the tank in three ways:

1. Gold plated on the work.
2. Gold plated on the wires or racks.
3. Gold carried out by dragout.

The first item is the important and essential one and must be carefully controlled to prevent wasteful over or under plating. The other two are undesirable but more or less unavoidable forms of waste, and control must be exercised to reduce them to a minimum.

The gold that is taken out of the tank by these three routes must be accounted for and replaced promptly —as a matter of fact, replaced prior to removal, for best results—if the

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tank is to be kept in proper operating condition over a long period of time.

Very often a plater will complain that he makes replenishments very religiously yet his plating bath goes bad in a very short while and he has

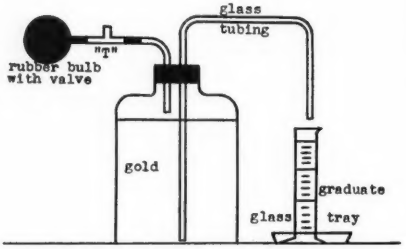



Fig. 53—Illustration showing a drawing of a gold stock solution dispenser of the pressure system type

to dump it out and make up a new one. On investigation you may find out that the replenishments are haphazard at best, being made at infrequent intervals with no account taken of metal lost through dragout or plated on the wires. Furthermore, the replenishments when made have been "Scotch," the plater seeking to prove to his boss that he is not using much gold. What happens in cases like this where desultory and inaccurate replishments are made, is that the gold concentration goes down and down and as it does, hydrogen evolution increases with accompanying rapid oxidation and decomposition of other ingredients in the bath. Where no replenishments are made at all, the process of deterioration is very rapid indeed and as was pointed out in a previous article, new baths may have to be made up every day where large production work is done.

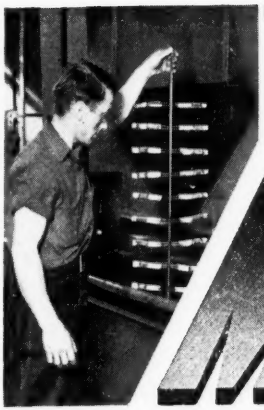
It is a fact that the properly replenished gold plating bath will last for a long time before it comes to grief because of poor color, carat or plating efficiency. That this is actually so and not a hypothetical fancy we can attest to, because we have worked with production gold plating baths turning out thousands of pieces daily, with color holding continuously, that did not have to be dumped in a period of a year or more. The reason that these baths held up so successfully was because every bit of gold that left the tanks was accounted for and replaced.

### 1. Gold Plated on the Work

The important thing with regard to gold plated on the work is to know how much gold you want to put on and to control the time and current so that you put this amount on, no more no less. Combine this with an occasional analysis of gold content to check on your time and current figures and you have good control over the amount of gold deposited on the work.

The governing factor is Faraday's Law which tells us that the weight of gold deposited varies directly with the current and the time of plating. A chart of this function is shown in Figure 54. If the pieces to be plated are alike or fairly similar and the deposit is to be a heavy one, it is not hard to control the operation so that you get the proper amount of gold deposited as computed from the chart; it is where flash plating is concerned that difficulties crop up.

In heavy plating, a definite amount of gold is to be plated on a given number of objects, let us say N objects, each to get a deposit of G grams, and the total amount of gold you have to plate out is GN grams. or ounces, if that unit is used. You look up the nomograph, assuming 100 per cent cathode efficiency, and it tells you that you will need H ampere-hours of current to deposit this amount of gold. If you have



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an ampere-hour meter you may set it for H ampere hours and put in the load to plate. If you haven't got an ampere hour meter, you may put in the load and adjust the rheostat until the current becomes steady at the desired value, then set an alarm clock or interval timer to ring at the point where the product of amperes flowing, a constant in this case, multiplied by the time of plating gives you H ampere hours.

Remove the load at the proper time, rinse, dry and then weigh. If the cathode efficiency is 100 per cent, then the weight of the load after plating minus the weight of the load prior to plating, we are assuming it has been so weighed, should be equal to GN; that is,

$$W_a - W_b = GN$$

It will be found that the left hand side is never equal to the right in the above equation, as this has been derived on the basis of 100 per cent efficiency. Since the efficiency is never 100 per cent you will have to calculate the efficiency from the first trial load and make a correction for this factor. The cathode efficiency is obtained by determining the value of the fraction $\frac{W_a - W_b}{GN}$. Let us assume that this fraction works out to be .8, then the cathode efficiency of the particular plating bath under the current operating conditions is .8 x 100 or 80 per cent. This means that all plating times will have to be figured on this basis. Thus, if on a 100 per cent basis you figured out you would need 10 ampere hours to deposit the required metal, the actual amount needed is 10/.8 = 12.5 ampere hours. The chart simplifies the computation. Knowing the cathode efficiency of the gold plating tank, you can now set the ampere hour meter or interval timer for the proper time to give the correct weight of deposit. Once this is worked out, then for every similar load run the same way you will obtain the same results. You know how much gold you are putting on, and as far as control goes, the situation is well in hand; all that is needed from this point on is an occasional check weighing and anlysis.

With flash plating or light gold plating baths the situation is somewhat different. In this case, cathode efficiency is relatively unimportant. We

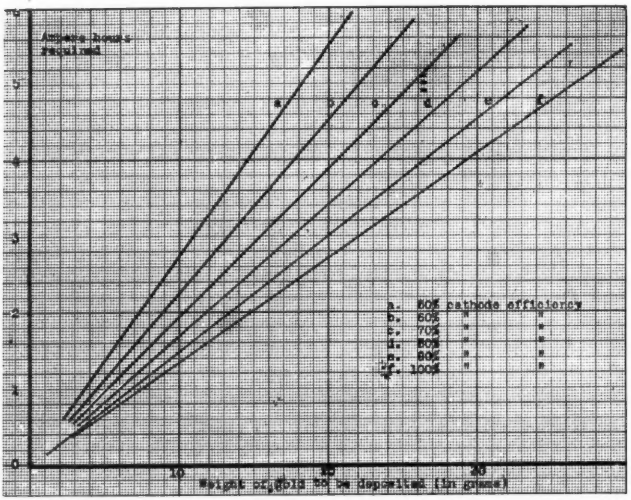
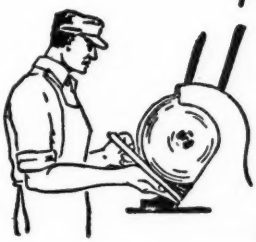



Fig. 54 — A graph which shows the function of the weight of gold deposited with the current and time of plating

# LEA FINISHING ENGINEERS



## THIS IS IMPORTANT!

Because of certain shortages, will you be obliged to change the design of your product or adopt different fabricating materials in order to hold your market?

If you must change, will your present finishing methods apply?

If ever a broad experience in the technique of finishing articles is coming in handy, it is right now with the whole manufacturing industry—metallic and non-metallic—being forced to completely reorient itself as to design of products and materials of which they are made.

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are interested only in depositing just enough gold on an object to give it the proper color and every molecule of gold plated on the object over this margin is sheer waste.

In this case, particularly where various types of objects are plated, as in costume jewelry plating, we must rely on what we call the concept of "average loads" in order to gain control of the operation. With the bath freshly made up, a few average loads of the size usually put through during the course of the day are run in the tank, after which a sample of the gold solution is taken with the electrolyte at the correct operating level. If n loads have been plated and the concentration of gold at the beginning was $C_o$ and the gold concentration in the tank after n loads have been plated is $C_n$, then the weight of gold plated out per average load is $\frac{V(C_o - C_n)}{n}$, where V is volume of the plating bath.

If no means for chemical analysis are available (samples of the electrolyte can be collected in two bottles by the plater and sent out for analysis to a competent chemist), then a pulp balance of some sort must be used. Several loads are weighed in the dry state prior to, and after plating. The difference in weight per load gives the amount of gold plated per load. If one whole average load cannot be weighed at once because of the balance's limited capacity, then the load must be weighed piecemeal, or, alternately, several sample pieces of average size and area can be selected from each load and weighed prior to, and after plating. The weight of gold on these pilot pieces multiplied by the number in a load gives a rough idea of the amount of gold going out per load.

Of course, these approximate control methods in flashing are based upon the assumption that the average load is always held in the tank for the same interval of time. This, unfortunately, is not necessarily true. On some occasions the plater will hold the load in the tank for a longer time than others, even though the loads are similar and all other conditions are equal, either because of personal idiosyncracy, or because of some distraction. This, of course, means that widely different amounts of gold will be going out on average loads.

The difficulty can be largely overcome if the load is being plated for sixty seconds or more, by use of an hour glass type timer which can be made up according to specifications as to length of running time, very inexpensively. The plater, on putting the load into the tank, turns over the hour glass and after the sand has run out of the glass, he removes the load from the tank. If a complaint is made that the operation of turning the glass distracts the plater and prevents him from using his two hands freely on the load, it does not take a great deal of mechanical ingenuity to contrive a gadget whereby the hour glass is turned over by steping on a foot pedal, thus leaving the plater with both hands free.

Where the objects are plated for 60 seconds or less, as is very often the case, reliance must be had on a large clock with a full sweep second hand that is easily visible from the gold plating tanks. It is impossible to depend on mental counting for timing in these cases, since every person's idea of second counting is different. The writer on one occasion had the opportunity of clocking with a stopwatch a gold plater who was supposed to be counting out 45 seconds with every load without view of any kind of a watch or clock and

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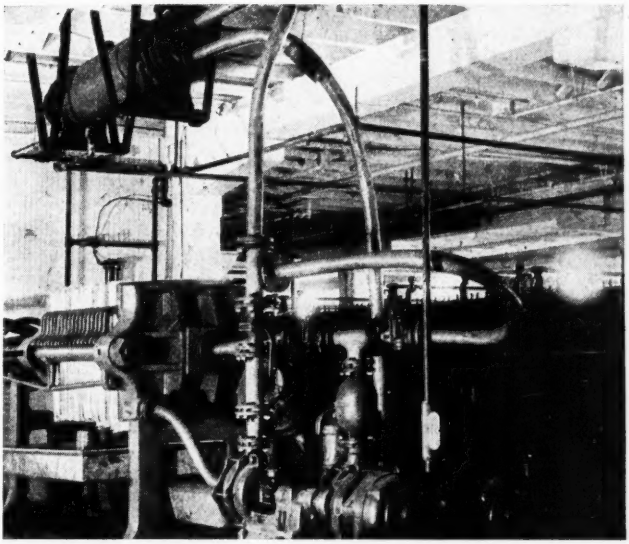

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the variation ran from 30 seconds to almost a minute and a half, depending on the plater's mood of the moment. Since all that was required was the weight of gold that took 45 seconds to deposit on the given loads, unusually long counts were costing the management a lot more in gold wastefully plated out.

**2. Gold Plated on Wires and Racks**

The question of gold plating out on racks and wires appears like an insignificant one to many gold platers, but it should not be. A surprising amount of gold can be plated out on wires in a short period of time. Gold that is taken out of the plating bath this way must be replenished if we want our plating bath to last. Usually it is not taken into account and even though what seem to be reasonable replenishments are made, the bath goes down hill in a short while.

To keep this waste item as small as possible, we heartily recommend the use of insulated racks instead of wires, wherever possible. As pointed out by the writer, insulated racks are far superior to bare wires in many respects[1]. Insulated racks save on gold plated out, reduce copper costs which, incidentally, is very important now, reduce current consumption, speed production and save time and labor and even help reduce dragout losses. As to why racks are so superior to wires we will not go into at the moment, preferring to save this discussion for a later paper dealing with the design of plating racks for gold plating. But we will show right now by a typical case, why they do save gold.

In the gold plating of certain electric razor heads No. 22 wire was used for stringing the heads and a length of at least 4 inches of wire per head was found necessary in stringing, to prevent bumping and scratching. A deposit of approximately .00001 in. was experimentally put on the heads. For this same system the writer designed insulated plating racks that exposed only .5 inch of bare No. 16 wire per head mounted. Assuming the wires received .00001 in. plate, what was the saving, if any, between the two?

With sufficient accuracy the weight of gold deposited on the rack contact per piece plated is:

$$.05 \times 3.14 \times .5 \times .00001 \times 9.25 = .0000073 \text{ oz. troy}$$

where .05 in. is the diameter of No. 16 wire, 3.14 is pie, and 9.25 the weight in troy ounces of a cubic inch of gold.

The weight of gold deposited on the wire per piece is:

$$.025 \times 3.14 \times 4 \times .00001 \times 9.25 = .000029 \text{ oz. troy}$$

where .025 is the diameter of No. 22 wire. According to this, four times as much gold $\left( \frac{.000029}{.0000075} = 4 \right)$ is plated on the wire as is plated on the rack. The actual saving per piece is .000029 — .0000073 = .0000217 or .000022 to the nearest millionth. With a thousand pieces plated daily, the saving is only 77 cents, which seems trifling, but in actual practice the amount or thickness of deposit put on was increased to .0001 in., as the .00001 in. thickness was too thin to provide proper color. This meant that the saving was now $7.70 per day or $2,310 per year (300 working days).

Getting back to the main subject, in order to determine the amount of gold plated out per average load on the wires, weigh the wires used for racking, before and after plating. The difference in weight gives the weight of gold deposited on the wires. If you are already using racks, weigh the dried racks before and after plating, making sure to rinse and dry

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them thoroughly. If you are using racks of a type that carry tips that can be unscrewed, the problem of weighing is somewhat simplified. Remove the tips and weigh before plating, then put them back on and plate, then remove them again and reweigh. This will provide a good idea of the weight of gold put on the racks in plating an average load.

### 3. Gold Lost in Dragout

The subject of dragout from gold plating tanks has been discussed in a previous paper quite thoroughly and we will not go into that phase here. Suffice it to say, however, that this item must also be considered in replenishing the gold plating bath, for as was then shown, the tiny drops of gold plating solution removed by carry-over, add up to large losses.

There are several methods for determining the loss by dragout from the average load and the simplest one is the one involving the use of a hydrometer and rinse tank as described in Part 8 of this series. This will provide a fairly good approximation of the amount of gold lost by dragout per load plated.

Once these seemingly tedious initial measurements have been made to determine the metal plated on the average load, the metal plated on the racks, and the metal lost by dragout, the rest becomes simple, as we can safely assume these figures vary very little in plating our average load. Thus, we have a set of constants for the given tank and the given class and type of load. With these constants known, it becomes a simple matter to properly replenish the plating tank.

A tank control record should be kept by the plater or his assistant which can be designed or arranged according to individual needs; a form for this is shown herewith.

**Tank Gold Record**

Tank No..... Date.... Run No.....
Lot No..... Description.....
Wt. of gold to be plated out.....
Time for plating.....
Grams gold removed on work.....
On racks..... By dragout.....
Total amount of replenishing gold...
Remarks .....

This form is by no means the best or most efficient one that can be arranged but is only given as a suggestion. Plant management can devise one best suited for its own needs. A record of the amount of gold returned to the refiners for credit completes the control system.

With such an arrangement a fairly accurate perpetual inventory can be kept of all gold in the plant, thus the plating room is run more scientifically and efficiently and "everything is under control."

[1] Racks vs. Wires.—Joseph B. Kushner. Metal Industry, Oct. 1939.

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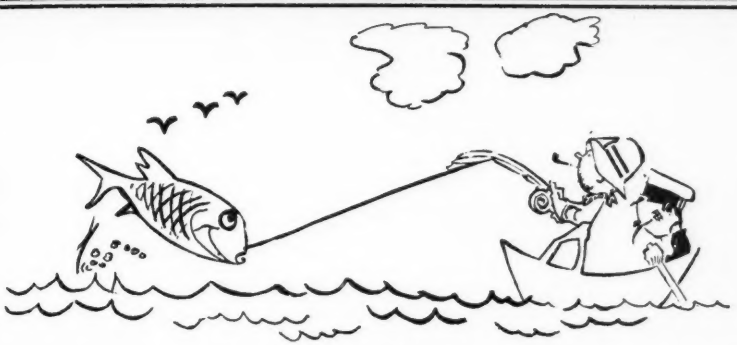
A copy of descriptive data 4004 may be obtained from department 7-N-20, Westinghouse Electric and Manufacturing Company.



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# Barrel Finishing o

## *Continuing Factors in Barrel Finishing of Plastics and Other Metallized Materials.*

By H. LEROY BEAVER

Barrel Finishing Consultant
Lansdale, Pennsylvania

SINCE the publication of the two immediately preceding papers on the subject of the barrel finishing of substitute materials that might be required for use in the current emergency, many questions have come in to us relative to phases of the subject on which we did not touch because we felt that they did not come strictly within the province of a discussion of barrel finishing procedure. However, we will in this discussion undertake to clarify some of these questions that were asked in the main, and to clarify them with respect to their relation with barrel finishing.

In a preceding paper, we stated that parts made from plastic materials were formed by principally compression molding, sawing, slicing and also by blanking from sheet material and that many parts were turned from rod material much the same way as metals are handled in automatic screw machine practice. The subject of blanking parts from strip material or sheet has been among the foremost, especially with concerns who are now doing metal stamping or have press shop facilities where the question of the use of substitute materials is having serious consideration.

Can the same dies now used for blanking metal parts be used for blanking plastic materials, and if so what would be the difference in the character of the edge of the formed blanks from that of metals? No yes-or-no answer could be given to this question because so much depends upon the material itself. We have plastics of many kinds and in the manufacture of the material, especially in the opaque colored varieties, either cotton or wood flock is used. Depending on the proportion of flock added might well depend the answer as to whether the material would work in the same dies as metals.

Some plastics are just what the name would imply, that is "plastic" while others might just as well be comparatively brittle. The general practice would be to heat the material in a water bath to warm it for easier operation through the dies, but with respect to the tolerances between punch and dies, we believe that is a question for the engineer-

ing department of the particular plastics manufacturer to answer, and we would therefore suggest that after you have selected the plastic you want for your work that you ask the manufacturer for this information.

Now as to the edges of blanks. Plastics do not burr on the edge in the same sense as would metal blanks, but very much the same thing happens in blanking plastics as in blanking metal. That is, the descending die will push itself partly through the sheet and then the balance of the cut will be snapped off and this may leave a projecting ridge on the underside of the blank, much the same as we see in metal blanks, and at least half of the cut will be somewhat rougher than the other.

Then comes the question of whether in a subsequent barrel finishing operation an equal radii can be produced on each edge of the blank. The answer to this is no, because we are unable to gain this result on metal parts and have been unable to accomplish it on plastic or other substitute parts on which we


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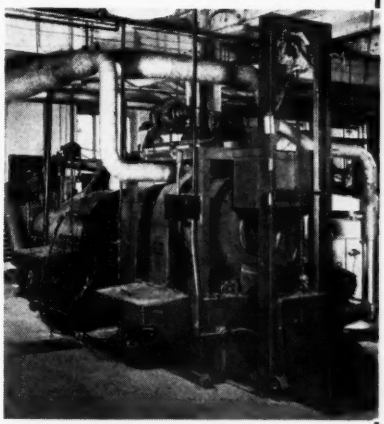

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have experimented, and for the following reason. When the punch first engages the material to force it through the die, the element of pressure is present and in the first half of the blanking operation the material is compressed, or in a sense work hardened which is not true of the snapped off portion. This first pressure cut is rounded off to some extent while the snapped off edge is generally square, and in the case of metal, if tolerances are wrong or dies dull it is on this edge that we pull burrs.

In the first finishing operation following the forming of the piece, abrasive materials are used, and in plastics this is termed as "ashing" operation as distinguished from what in metal finishing parlance is known as a "cutting down" operation. Theoretically in a barreling operation, and especially where abrasive materials are used, the operation is supposed to remove material equally from every part of the surface. We have previously explained that this is not true with respect to metal parts nor can it be true with respect to parts formed from plastics.

The edges of any part, whether metal or plastic, will cut down or ash down faster than the flat areas, and the curve of this reduction will very closely follow the original curve on the blank, so that if in the first blanking operation we have unequal radii on the upper and lower edge of the blank, we will most certainly have them on the blank after the ashing operation. If there is a necessity for a nearly perfect radii, then we would suggest that the parts be formed by some method other than blanking.

Plastic may be obtained from manufacturer moulded to shape and in rods perhaps 18 inches to two feet long. These rods can be either heated and then sliced in sections of the desired thickness or else formed with flexible saws. In either case the edges would be the same and for that reason in the ashing operation in the barrel, these edges will reduce to the same degree and thus produce equal radii.

We are writing now not of finishing plastics as such, but of finishing plastics that have been metallized and then plated for use as substitutes for metals unobtainable for the various purposes for which the plastic parts are to be substituted.

The next question comes mostly from the same source, and it is, "If we can produce the blanks with our present equipment, and we believe we can, and having no barrel equipment or installation, what would it be necessary for us to obtain in order to finish these parts?" This question is not so difficult to answer for the reason that we have gone through with the installation of a considerable number of barrel equipments, and in the main, the requirements are much the same.

If your principal work is the production of stampings, and if you contemplate using the barrels after the current emergency on steel or other metals, then we would by all means suggest that you use the regulation standard burnishing barrels preferably with hard maple or sappy yellow pine liners. The barrels designated as the high and narrow type would be best because they provide for the concentration of greater pressure on the parts in process. If it is desired to operate them on metal parts later, the only requirement would be new liners and loads of steel burnishing materials to replace those used on the lighter plastic parts.

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production, then you would, of course, install the lighter weight barrels used on plastic materials and to a considerable extent on light weight light gauge metal parts that will not withstand the pressures developed in regular barrel finishing equipment where the burnishing mass is composed of steel materials as distinguished from the fibers and other lighter products used in a plastic or plated plastic finishing program.

In the development of the barrel finishing of lighter than metal materials, there has g r a d u a l l y been evolved a setup that perhaps for want of a better name we would designate as an "initial installation." Such installations have been used for experimental work and even where the practicability of the process is well known, manufacturers generally seem to like to feel their way along, hence these initial installations. In the case where the equipment is to be later used on metals, the typical installation consists of two barrels both wood lined and in size 30 in. in diameter and 16 in. wide. These are most generally driven by belt from line shafts.

When these barrels are to be used on metal products, the liners are taken out, and only one barrel re-lined. In this way, we have a cast iron barrel shell used for abrasive cutting-down operations and the wood lined barrel for final barrel burnishing for finish. These barrels are mounted side by side. In the case of an initial installation for lighter than metal parts, a two-barrel installation is also used, but in a wide majority of cases these barrels instead of being mounted side by side, are mounted one above the other, principally to conserve factory floor space and for the further reason that the first operation may be performed in the upper barrel and the parts then dropped down into the lower barrel for the final finishing operations.

There is a difference, however, in the power requirement for in the case of the side by side operated regulation barrels it will require about 1½ h.p. for each barrel, while in the lighter barrels one mounted above the other, 1 h.p. will suffice for both barrels. These initial installations have in a sense almost automatically divided themselves into two kinds, in one of which the two barrels are 24 in. in diameter and 36 in. long. Such barrels are invariably m a d e into what are called two compartment barrels, that is, they have a partition in the center. The other popular style is composed of two barrels 30 in. in diameter and 24 in. wide, but these are single compartment barrels. The normal operating load of parts is from two and one-half to three pecks per load.

While the burnishing mass, as it is called when used on metal parts, is generally composed of steel balls or other steel forms, this mass when used on plated plastics or other light weight substitutes is far different in character and for the most part the weight factor is gained by using a mass composed of crushed corazo or vegetable ivory nuts, crushed and graded to appropriate sizes, and which are more often known as barrel burnishing "chips."

While we could almost run the entire gamut of Mohs' Scale in the selection of materials to be used as abrasives in these finishing operations, we do, for the most part, keep well within the lower range, seldom going beyond five. Many of the finer finishing operations are performed with number one, represented, for example, by magnesium silicate or talc which is very friable and perhaps the softest of our abrasives and one which removes the very mini-

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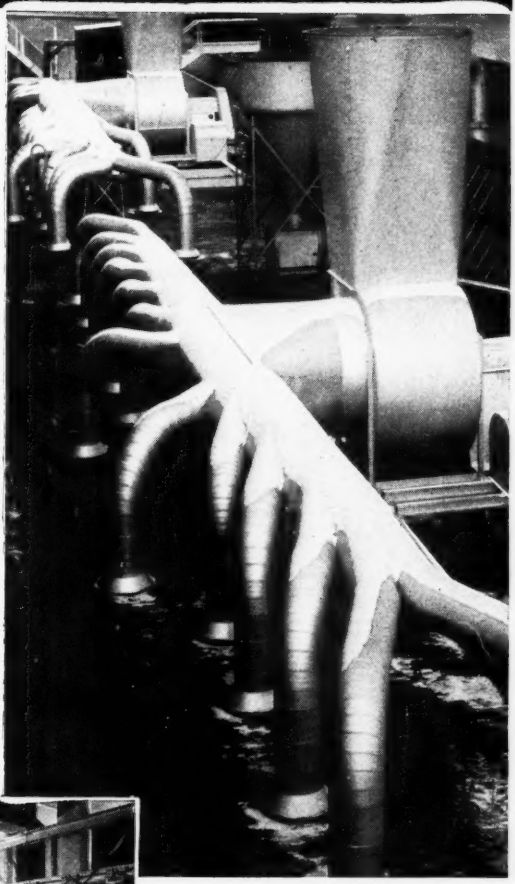

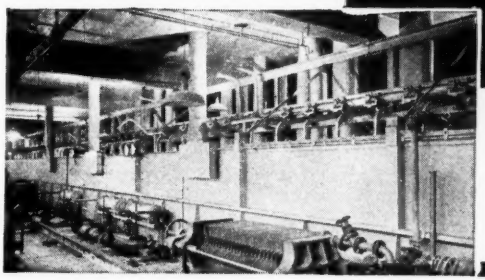

*These views — the plant of a large manufacturer of electric refrigerators— show a KIRK & BLUM installation on a Stevens Automatic Cleaning and Pickling machine, and the suction piping connections and header, exhaust fans and discharge stacks above factory roof.*

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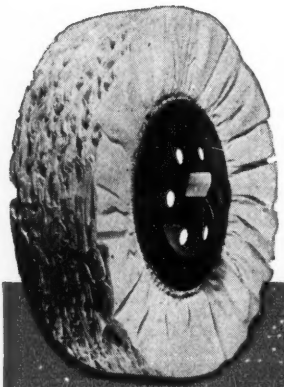

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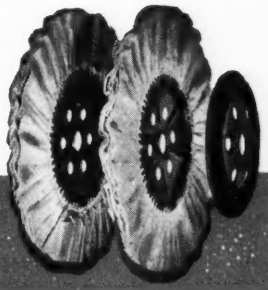

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mum of surface.

The conception of some that we can simply dump into a barrel an appropriate load of chips and a quantity of abrasives and go ahead with the operation, of course, simply does not work out because the abrasive would sift down through the mass and follow closely the periphery of the barrel and there would be nothing to hold the abrasive in suspension within the mass wherein the parts are operating, and for this reason we are required to use carriers. These carriers are invariably some natural fibrous material and for the most part maple sawdust of somewhat coarse texture is the one principally used. This carrier must first be treated, and manufacturers of materials for this type of finishing have worked out to a nicety the character and quantity of binder material to be used to hold the abrasive in suspension.

Glue that sets hard cannot be used for this in combination with the abrasives may tend to scratch or score the parts and for this reason various combinations of tallows, waxes and greases have been developed that act in the same way in setting up each sawdust grain with abrasive as would be obtained in setting up a wheel with glue and abrasive. The quantity of this coating material to be used is critical, because if not enough is used it will wear away too rapidly and release the abrasive, and if too much is used it will have a tendency to rub off or deposit undue amounts in angles or grooves of the parts which will then receive no finishing action and where at times it may be difficult to remove following the completion of the run. Manufacturers of this type of material have done much research to determine the best materials and the proper proportion of binder to use with a given quantity and size of abrasive material and experience has shown that it is best to depend on them rather than to undertake a complete line of research in each plant.

Generally speaking, the operating cycles are longer on finishing metallized and plated plastic parts than they would be on metal parts for the reason that the weight factor is absent both with respect to the parts to be finished and the finishing mass, but the special barrels as we have described as initial installations are set up in such a way that they operate on a twenty-four hour schedule. In all that we have thus far worked with, they are fitted with overload automatic switches that throw off the power from the driving mechanism at the first sign of trouble.

Naturally, when we use a weight-carrying medium such as corazo nut or vegetable ivory chips the question will arise as to whether or not these do not wear away rapidly and require constant replacement. We have made some time study tests on this factor, and in cases where an initial load of 300 pounds of chips was used and in an operating cycle of 26 hours, the average loss in chip weight was about two pounds. This test was made during the ashing or abrasive operation.

On the polishing operation, using a like quantity of chips, the loss was about ¼ pound in a run of eight hours, so that the factor of chip replacement is not an important one nor is it especially expensive when compared to the quantity of parts finished. When the cost of the weight carrying mass is added to that of the abrasive or polishing medium used in combination with the sawdust, the average costs per load have been approximately 18c for the ashing or first operation and approxi-

mately 13c per load for the final or burnishing operation. This is based, of course, on the operation of a load of approximately two and one-half pecks of parts.

As we have stated, the range of materials and sizes used is very wide. Even after plastics are metallized, generally with silver, to take a subsequent plate of copper or some other metal, if this plate is too rapidly deposited, the surface may have a rough texture in which case a faster cutting material would be used than if the plated surface was comparatively smooth.

We would not advise a "cut and try" system in each individual plant because one need only send a sample of the part to any of the makers of this type of equipment and they can determine from their previous experience what method will have to be used and what materials will produce the most satisfactory finishes in the shortest operating cycles.

# American Silver Producers' Research Project

THE American Silver Producers' Research Project, sponsored by several of the leading silver producing companies in the United States, has completed a year of activity at the Bridgeport, Connecticut, plant of Handy & Harman. The project, formerly located at the National Bureau of Standards, Washington, D. C., was reorganized June 1, 1940, and the research program and activities were transferred to the laboratories of Handy & Harman.

The field of electroplated coatings continues to show promise as an outlet for silver and the project's pilot plating plant has been kept busy recently plating drums, pails, and cans. At the present time one of the large can manufacturers is cooperating with the project and a chemical supply house in the development of a silver lined can for packaging chemicals. This work, still in the early stages, is progressing satisfactorily and shows promise.

Containers with a silver plated coating also have been packed with different commodities and some experimental units have been put into service. The results reported so far have varied and at the present time it has not been determined why containers, in some cases, have been quite satisfactory and in others, products have been contaminated.

One of the criticisms of silver-lined containers appears to be that they do not give sufficient advantages over those now in use to warrant the additional cost. For the general run of containers this, at present, is undoubtedly the case, but it is not true for packaging some specialized products. In some instances, silver-lined containers are being seriously considered and tested for packaging corrosive materials because of the corrosion resistance afforded by the silver linings.

In recent months, the scarcity of many base metals has focused attention on the use of silver as a substitute for aluminum, nickel, and tin. In places where sheet or foil aluminum has been used, for its corrosion resistance or high reflectivity, it is apparent that silver plating on available metals can be substituted, since it possesses these qualities, for most purposes, to an even better degree than aluminum.

Silver electrodeposits are being investigated as a substitute for nickel, as an undercoating for chrome plating. A series of experiments are un-

der way to determine what advantages may be derived from the use of a corrosion-resistant electroplate of silver followed by a hard, wear-resistant chromium deposit. It is hoped that the two metals, aluminum and nickel, badly needed for National Defense, which are used in refrigerator shelves, ice cube trays, toasters, waffle irons, and others, can be replaced, at least in part, by silver.

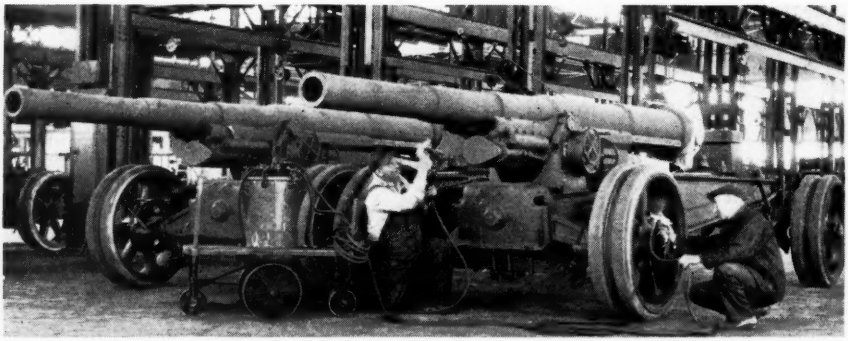
The Silver Project's Fellowship at Lehigh University has continued with the corrosion studies of silver. The corrosion tests made include not only a study of different chemicals but also a study of a large number of different commercial products which may be manufactured in silver equipment or packaged in silver containers.

More recently a study has been started on the corrosion of silver-to-silver joints made with different silver brazing alloys. This is of particular interest in connection with the manufacture of silver-lined chemical equipment. All of this work has been carried on in a thorough and comprehensive manner and much available data has been obtained.

# Reconditioning Heavy Armament

OUT at La Carne, Ohio, on the shores of Lake Erie, the greybeards of America's ordnance reserve are being readied to serve in the defense of the country, many of them for the second time in 25 years. These greybeards aren't in the form of human beings. They consist of thousands upon thousands of huge rifles and howitzers manufactured during World War I, and many similar field pieces brought back from France when Johnny came marching home again in '18 and '19.

Reconditioning of these guns is being carried out at the Erie Proving Ground where many of them were stored after the last war, and which today is serving as a center for the reconditioning of heavy artillery. The equipment being readied for service includes everything from French 75's to huge 250 mm. Howitzers. Prominent among the pieces are 155 mm. GPF's, the type of long-range cannon which played a major role in smashing the German armies during the latter phases of World War I.



Spraying Reconditioned 155 mm. GPF's

While final reconditioning work is being carried on today, the task of keeping the equipment in tip-top shape down through the 22 years since the end of the last war was an enormous one, according to Guy W. Lotridge, foreman of the reconditioning shop and an employee at "Erie" since 1918. The inside of the gun barrels had to be kept virtually bathed in preservative greases, and the outside of the barrels heavily coated with paint to guard against corrosion.

Until 1927, no preservative grease which would hold up for any protracted period was available. Hence that phase of the work, says Lotridge, presented an almost constant problem. The matter of keeping the equipment painted, however, posed far less difficulty, for even in the days of World War I spray painting equipment was available and was used in the work on the big guns.

The accompanying photograph shows workmen at Erie Proving Ground putting the finishing touches on one of the huge 155 mm. GPFs with a DeVilbiss spray-painting outfit. This is just one of the dramatic instances in a series too vast to outline herein where spray painting is playing a vital part in readying America for any emergency whatsoever.

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# A *Practical and Theoretical Explanation of Corrosion**

By WALLACE G. IMHOFF, B.A., B.S., M.S., Met. E.
President of the Wallace G. Imhoff Company, Vineland, New Jersey

The characteristics and properties of acids are the properties of H. ions, and thus the H. ions are said to have a sour taste, redden blue litmus, conduct electricity in solutions containing them, etc. The basicity of an acid is fixed by the number of H. ions furnished by the complete ionization of one molecule of the acid. Thus monobasic hydrochloric acid, HCl, furnishes one H. ion. $HCl \rightleftharpoons H^{\cdot} + Cl'$; and dibasic sulphuric acid furnishes two H. ions.

$H_2SO_4 \rightleftharpoons 2H^{\cdot} + SO_4''$. Sulphuric acid also furnishes the ions H. and $HSO'_4$ so that it behaves also as a monobasic acid when it forms the so-called "acid sulphates." The complete ionization of sulphuric and carbonic acids are shown below:

| Sulphuric Acid | Carbonic Acid |
|---|---|
| $H_2SO_4$ | $H_2CO_3$ |
| $2H^{\cdot} + SO_4''$ | $2H^{\cdot} + CO''_3$ |
| $H^{\cdot} + HSO'_4$ | $H^{\cdot} + HCO'_3$ |

This clearly shows the hydrogen ions of both acids to be the same, both have the two ions by dissociation.

The chemical equation for the action of hydrochloric acid on the metal zinc is as follows:

$$Zn + 2HCl = ZnCl_2 + H_2$$

The ion hypothesis assumes that:

$$Zn + 2H. + 2\ Cl' \rightleftharpoons Zn.. + 2\ Cl' + H_2$$

and that the different atoms have different affinities — electro-affinities — for electric charges. The hydrogen ion is an acid because it holds its charge less tenaciously than do the metal ions. It is to be noted that the Cl′ ion is little affected by the change, and therefore the equation might be represented as follows:

$$Zn + 2H. = Zn.. + H_2$$

The action is thus independent of the negative ion, for it involves little more than a transfer of the positive electric charges from the two hydrogen ions to the zinc, and generally such typical chemical reactions can be represented as the transfer of electrical charges from hydrogen to the metal.

By the same analogy we obtain the following equations with iron:

$Fe + 2H. = Fe.. + H_2$ and $2Fe.. + 2H. = 2Fe... + H_2$

Just as an acid has been defined to be a substance which can furnish hydrogen ions when dissolved in water,

* *Continued from the July issue.*

so bases, according to the ionic hypothesis, are substances that yield OH′ ions when dissolved in water. The basic properties of bases are due to the OH ions, and in this sense it has been said that "there is only one base, and that is OH ions," and the terms base and hydroxyl are the same. The general and characteristic properties of the bases are supposed to be the general and characteristic properties of the OH′ ions. Thus the OH′ ions are said to have a soapy feel, turn red litmus blue, conduct electricity in a solution containing them, etc. The acidity of a base is fixed by the number of OH′ ions it furnishes on complete ionization of a molecule of the base. Thus the uniacid bases, like sodium hydroxide, ionize:

$$NaOH \rightleftharpoons Na. + OH'$$

and the biacid bases, like iron hydroxide, Fe $(OH)_2$, ionize:

$$Fe(OH)_2 \rightleftharpoons Fe.... + 2\ OH'$$

Ferric hydroxide ionizes as follows:

$$Fe(OH)_3 \rightleftharpoons Fe... + 3\ OH'$$

In a non-ionizing solvent the bases do not furnish hydroxyl ions, and they do not then behave like bases. Thus a base is a compound which furnishes hydroxyl ions when dissolved in an ionizing solvent. A compound becomes a base only when it is ionized into hydroxyl ions.

From the above discussion it is now seen that the mechanism of rusting is through ionization, and this explains why when no water is present iron will not corrode. Ionization is the medium through which the process of corrosion goes on. It is also clear now why the hydrogen in methane, $CH_4$, ammonia, $NH_3$, alcohol, $C_2H_4OH_2$ and thousands of other compounds does not act like an acid. Hydrogen ion, H., is the only acid there is, and when hydrogen is not ionized, it is not an acid. It was also previously shown that in some com-


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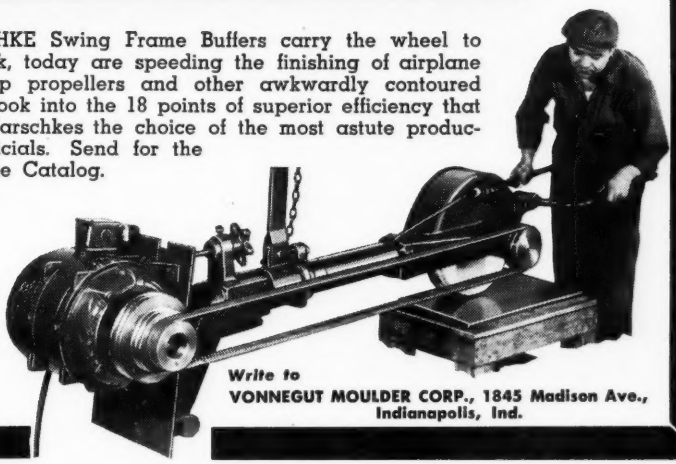

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pounds the hydrogen may only be partially ionized. A typical instance is the compound $H_3PO_2$ which only gives one hydrogen ion per molecule, the other part being the cation, $H_2PO'_2$. An acid is strong or weak, depending upon how much it is ionized. The same may be said of bases. Muriatic acid, HCl, is ionized 0.78 and is, therefore, a strong acid.

In considering the ionization of acids and bases, the following data is of particular interest to galvanizers:

The different degrees of acidic activity are:

1. The ionization in decinormal solution exceeds 70 per cent; e.g., nitric acid and hydrochloric acid. These are the acids which are chemically most active, for their solutions contain relatively high concentration of hydrogen ion.

2. The ionization is between 70 and 10 per cent; e.g., sulphuric and phosphoric acid. These acids are noticeably less active, for their solutions contain lower concentrations of hydrogen ion.

3. The ionization is between 10 and 1 per cent; e.g., acetic acid. These are the weaker acids, for their solutions contain very small concentrations of hydrogen ion.

4. The ionization is less than 1 per cent; e.g., carbonic and boric acids. These are the feeble acids, for their solutions contain only minute concentrations of hydrogen ion.

Bases are strong and weak according to how much they ionize:

1. Ionization high; e.g., potassium hydroxide. These bases are active, for their solutions contain high concentrations of hydroxide ion.

2. Ionization less than 2 per cent; e.g., ammonium hydroxide. These bases are weak on account of the low concentration of hydroxide ion.

Water is less ionized than any other substance in the list. It shows, therefore, little or no interaction with acids, bases, or salts, and hence is valuable as a solvent for these substances. Its ions are H. and OH′, and it is thus as much an acid as a base.

Since water performs an important role in the rusting and corrosion of iron, it is of particular interest to know more about how it functions according to the ionic hypothesis. The ionic hypothesis, as we have seen, refers acidity to the presence of hydrogen ions, and alkalinity to the presence of OH′ ions, and the term "neutrality" refers to the case where the concentration of both ions are the same, or both ions are absent. Water is a constant product of the reaction between the solution of an acid and a base. This is shown in the following example:

$$HCl + KOH \rightleftharpoons KCl + H_2O ;$$
$$H_2SO_4 + 2NaOH \rightleftharpoons Na_2SO_4 + 2H_2O$$

When solutions of an acid and base are mixed, the hydrogen and hydroxyl ions of acid and base respectively combine to form water, because water only ionizes to an inconceivably small extent, and the two kinds of ions, H. and OH′, cannot remain in the presence of one another uncombined. Hence when aqueous solutions of acids and bases are mixed together, OH′ and the H. ions are removed from the solution, and the reaction is almost completed:

$$H. + Cl' + K. + OH' \rightleftharpoons K. + Cl' + H_2O$$

The neutralization, therefore, of strong acids and bases involves little more than the formation of water:

$$H. + OH' \rightleftharpoons H_2O$$

The reverse process of neutralization is hydrolysis, and the action with water is represented as follows:

$$H_2O \rightleftharpoons H. + OH'$$

It is thus an obvious fact that the

- SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
EL ENGINES - FIREARMS - MAGNETOS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT
- BALL BEARINGS - BOLTS AND NUTS - DIESEL ENGINES - FIREARMS -
IRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS - BALL BEARINGS - BOLTS AN
MAGNETOS - SPARK PLUG SHELLS - AIRCRAFT PARTS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT
- BOLTS AND NUTS - DIESEL ENGINES - FIREARMS - BALL BEARINGS - AUTO PARTS - TOOLS -
PELLERS - TOOLS - AUTO PARTS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS -
- SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
EL ENGINES - FIREARMS - MAGNETOS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT
- BALL BEARINGS - BOLTS AND NUTS - DIESEL ENGINES - FIREARMS - BALL BEARINGS - BOLTS AN
AUTO PARTS - TOOLS - AUTO PARTS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS -
SHELLS - AIRCRAFT PARTS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT PARTS - BALL BEARINGS
BEARINGS - BOLTS AND NUTS - DIESEL ENGINES - FIREARMS - BALL BEARINGS - AIRCRAFT PARTS -
PARTS - TOOLS - AUTO PARTS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
MAGNETOS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT PARTS - SCREWS
BOLTS AND NUTS - DIESEL ENGINES - FIREARMS - BALL BEARINGS - AIRCRAFT PARTS - BOLTS AND NUTS -
TOOLS - AUTO PARTS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
- SCREWS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
AND NUTS - DIESEL ENGINES - FIREARMS - BALL BEARINGS - AIRCRAFT PARTS - BOLTS AND NUTS -
TOOLS - AUTO PARTS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
- SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS -
EL ENGINES - FIREARMS - MAGNETOS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT
- BALL BEARINGS - BOLTS AND NUTS - DIESEL ENGINES - FIREARMS - BALL BEARINGS - BOLTS AN
IRCRAFT PARTS - PROPELLERS - TOOLS - AUTO PARTS - SPARK PLUG SHELLS - AIRCRAFT PARTS - PROPELLER
RMS - MAGNETOS - SCREWS - SPARK PLUG SHELLS - AIRCRAFT PARTS - SCREWS
ARINGS - BOLTS AND NUTS - DIESEL ENGINES - FIREARMS - MAGNETOS - SCREWS
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beginning of the process of corrosion is to be found in this equation which provides available OH′ ions for the iron to form the insoluble ferrous hydroxide, $Fe(OH)_2$. The removal of these OH′ ions from solution, with the transfer of the two positive electric charges from the hydrogen to the iron, completes the reaction. The hydrogen is removed also by escaping as a gas when it looses its charges to the iron. The process of corrosion is, therefore, carried out first by the slight ionization of the water into H. ion and OH′ ions. The cause of the ionization of the water to begin with, that is the start, may be the force or tendency for the H. ion to want to discharge its electric charge to the iron. This in turn causes the iron to dissolve so that it can ionize and receive the charge. As soon as it receives the charge it immediately removes two hydroxyl ions from solution, and the hydrogen which gave up the charge to the iron escapes as gas. In this way both ions are constantly being removed from the solution, and as long as there is any iron left the action will continue. The action is kept going by the pressure, or static head, of the electric charge on the hydrogen ions in continually carrying them and discharging them on the iron ions. Just as soon as the iron has been exhausted the action ceases, and there only remains the tendency of the hydrogen ions (or electrical pressure if might be called that). The action must also stop if the water dries up, for this removes the mechanism through which rusting operates. (Ionization is possible.)

In order to remove the material entirely so that the rusting process can proceed, the ferrous hydroxide, $Fe(OH)_2$, which is insoluble, is further oxidized by the oxygen in the air to ferric hydroxide, $Fe(OH)_3$, which is also insoluble. Thus the iron, the hydrogen ion, and the hydroxyl have all been removed from the solution so that the action can continue. The hydroxide represents the saturation of the iron compound with water, but with changing conditions, drying out, and the loss of water, a readjustment takes place, perhaps represented by the chemical formula $Fe_2O_3 \cdot 3\ H_2O$. This places the ferric hydroxide in a state to gradually lose water by evaporation until perfectly dry, and all water is gone. This last stage would be represented by the chemical formula, $Fe_2O_3$. The color change is from the red hydroxide to the dark brown familiar rust.

To fully appreciate the process of rusting it is necessary to become familiar with the various forms in which hydrogen is found. Atomic hydrogen is represented by the chemical symbol H. In the atomic state it is an extremely active substance combining with explosive violence with many elements, such as oxygen and chlorine. Groups of atoms held together by atomic forces constitute molecules. Hydrogen, for example, consists of discrete particles, called molecules, each one made up of two hydrogen atoms. When the atoms of hydrogen unite with each other to form hydrogen molecules, the attractive forces about the atoms are largely satisfied. Molecular hydrogen, $H_2$, is accordingly an inert gas. The heat of formation of molecular hydrogen from atomic hydrogen is about 80,000 cal. per gram-molecule. These states of hydrogen are shown below:

1. Atomic Hydrogen ..... H
2. Molecular Hydrogen .... $H_2$
3. Two atoms of atomic hydrogen .....2H

Atomic hydrogen is called "nascent" hydrogen at the moment of its formation, since at that time it is chemically much more active than

ordinary hydrogen. Nascent hydrogen at the moment of its birth can do chemical work that the ordinary gas cannot do. According to the Ionic Hypothesis, in the reaction:

$$Zn + 2H. + 2Cl' = Zn.. + 2Cl' + H_2$$

there is little more than the transfer of two positive charges from the hydrogen ion to the zinc atom. Nascent hydrogen represents the condition of the element at the instant when its ions give up their electrical charges.

4. Nascent Hydrogen (active) H

The behavior of hydrogen in liquid water solutions is in the state known as hydrogen ion, H. In this state the hydrogen carrys a positive charge of electricity. Also hydrogen in this state is said to be the only true acid, and that all the acidic properties are only the properties of the hydrogen ion. The degree is represented by the degree of ionization of the acid. This state of hydrogen is shown in 5.

5. Hydrogen ion ..... H.
6. Two hydrogen ions .....2H.

HCl furnishes one H. ion.
$H_2SO_4$ furnishes two 2H. ions.
$H_2SO_3$ furnishes two 2H. ions.

One thing which has not been mentioned so far as being important in the process of corrosion is the tendency of the iron to return to its natural state. It is this energy head, if we might call it that, that keeps the reaction going. Speller says, "Iron in oxidizing to $Fe_2O_3$ evolves 1,746 calories per gram of the metal and this indicates approximately the inherent tendency of the iron to return to this combination." Here are two very strong forces to make the action go forward, the heat of formation of molecular hydrogen from atomic hydrogen which is 80,000 cal. per gram molecule, and 1,746 calories

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per gram of the metal in changing from Fe to $Fe_2O_3$.

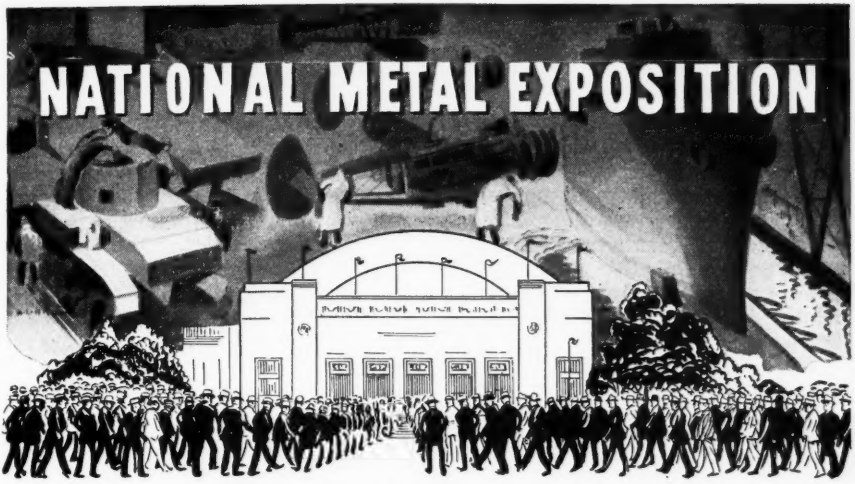
Another important factor is the difference of these two elements in the Electro-Chemical Series of the elements. The ordinary battery with copper and zinc poles is familiar to everyone. Zinc is 21st in the series and copper is 33rd. The iron-hydrogen cell is represented by iron, which is 22nd in the series and hydrogen, which is 43rd. The general action is the same as takes place in the copper-zinc battery. This Electro-Chemical Series of the elements shows the elements in the order of their chemical activity. The earlier members oxidize, or rust on exposure to the air.

Zinc is put on iron in the form of a galvanized coating because the zinc is electro-positive to iron and corrodes, or oxidizes first, thus protecting the iron beneath. The corrosion of zinc is called "White Rust." The ashes of this chemical reaction are the white rusts so often seen on galvanized pipe when stored in a damp place. The ashes of iron rusting is "Red Rust," and the ashes of hydrogen corrosion is water.

Returning now to the two theories for the rust or corrosion of iron, it is easy to show that the Chemical Theory and the Electrolytic Theory are one and the same theory. It is impossible for the Chemical Theory to operate other than through the mechanism of ionization, and this is the same method as the Electrolytic Theory operates. There can be no rusting without water, and the presence of water means ionization. It has also been shown that there is only

**ELECTRO-CHEMICAL SERIES**

| | | |
|---|---|---|
| 1. Caesium | 23. Nickel | 45. Silicon |
| 2. Rubidium | 24. Cobalt | 46. Titanium |
| 3. Potassium | 25. Thallium | 47. Columbium |
| 4. Sodium | 26. Cadmium | 48. Tantalum |
| 5. Lithium | 27. Lead | 49. Tellurium |
| 6. Barium | 28. Germanium | 50. Antimony |
| 7. Strontium | 29. Indium | 51. Carbon |
| 8. Calcium | 30. Gallium | 52. Boron |
| 9. Magnesium | 31. Bismouth | 53. Tungsten |
| 10. Beryllium | 32. Uranium | 54. Molybdenum |
| 11. Ytterbium | 33. Copper | 55. Vanadium |
| 12. Erbium | 34. Silver | 56. Chromium |
| 13. Scandium | 35. Mercury | 57. Arsenic |
| 14. Aluminum | 36. Palladium | 58. Phosphorous |
| 15. Zirconium | 37. Ruthenium | 59. Selenium |
| 16. Thorium | 38. Rhodium | 60. Iodine |
| 17. Cerium | 39. Platinum | 61. Bromine |
| 18. Didymium | 40. Iridium | 62. Chlorine |
| 19. Lathannum | 41. Osmium | 63. Fluorine |
| 20. Manganese | 42. Gold | 64. Nitrogen |
| 21. ZINC | 43. HYDROGEN | 65. Sulphur |
| 22. IRON | 44. Tin | 66. Oxygen |




# GOES *ALL-OUT* FOR DEFENSE

This year's 23rd annual Metal Congress and Exposition is going "all-out" for defense — giving the nation's defense producers a chance to take stock of their progress and study new methods and equipment for speeding defense preparations.

Each morning during the week of October 20th one of the government's leading executives will address the Metal Congress on defense progress and requirements in Army, Navy, Aircraft and civilian production. During the afternoon and evening sessions of the Congress, round-table discussions on the most important phases of armament production will be headed by armament experts.

These important sessions will attract thousands of "big-guns" in national defense production to Philadelphia's Public Auditoriums where more than 275 manufacturers will display their products at the Metal Exposition.

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Advance reservations are the heaviest in history; however, choice locations are still available at the regular $1.00 a square foot rate, so write, telephone or wire collect today for floor plan and full particulars. Address: W. H. Eisenman, Secretary, American Society for Metals, 7316 Euclid Avenue, Cleveland, Ohio.

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one acid, hydrogen ion H., so that carbonic acid, sulphuric acid, muriatic acid, and all the rest are the same acid, the only difference being in the degree of ioization of the hydrogen ion. The Chemical Theory is a little more round about but stripped of all its non-essentials it is exactly the same theory as the Electrolytic Theory. It is like going to town from two different directions; the end point is the same.

Another factor which has not been mentioned in corrosion is the speed of the reaction. An interesting and practical example of high-speed corrosion is the Bessemer process of making steel. Here we have no water present, only oxidation, and the end product is iron. The other impurities are corroded, or oxidized in from 7 to 12 minutes, and go up in smoke. A little slower corrosion, and still without water, is the open-hearth process of making steel. The oxidation is much slower, the impurities are not burned out as thorough, and there is less burning of the metal itself. Finally, the third stage of corrosion, low temperature corrosion (oxidation) with oxygen derived from the air and water, is the slowest of them all. The sum total heat and energy expended mightly possibly be the same, but in the first it is all expended in 12 minutes, while in the last stage it might take 12 years. The total energy expended in both cases might be the same, the main difference being that in the last process the destruction is carried on beyond the removal of the impurities and includes the destruction of all the base metal itself.

When the Bessemer converter is first turned up for a blow, heavy yellow brown smoke rolls out of it. It is cold and those yellow brown fumes are the burning of the iron. It is only a short time until the heat developed is enough to burn out the silicon, and finally the heat becomes sufficient to burn out the carbon. One by one the elements known as impurities are oxidized and burned out. The speed is fast. An important thing to remember in slow atmospheric corrosion is that the impurities go out in the same order. The time is longer, the temperature is lower, and the energy change infinitesimal as compared to these other high speed processes of oxidation. There is no high temperature, and the oxygen is derived from the air. Atmospheric corrosion is slow and tedious and may be considered the lower end of a process in which the front end is high speed oxidation at high temperatures, the middle of which is medium speed oxidation at high temperatures, and finally slow speed oxidation at low temperatures consuming the iron itself. High speed oxidation of iron is represented by the yellow smoke from the Bessemer converter; slow speed oxidation of iron is represented by rust.

The mechanism of corrosion has been c l e a r l y shown to precede through ionization and oxidation. The ionization is the medium through which it operates, and oxidation is the means of removing the materials out of the way so that the process can be continuous. To stop corrosion, therefore, two things must be done, namely:

1. Stop ionization.
2. Stop oxidation.

There are many practical methods used at present which include enameling, cadmium plating, chromium plating, Parkerizing, oiling, painting, greasing, japanning, and a host of other processes. The most common method of protecting iron and steel is by the hot-galvanizing process. All of these processes aim to stop oxidation of the base metal, iron or steel.

Any of the metals above iron in the Electro-Chemical Series if used as a protective coating will corrode and oxidize first, thus protecting the steel base underneath. Zinc is one of these metals.

Some galvanized coatings fail much quicker than others and the reason has often been asked. There are three factors that affect the destruction of the coating. These are:

1. The purity of the metal in the base.
2. The purity of the zinc used as coating.
3. The method, or way it is put on.

A great amount of work has been done on the corrosion of iron and steel by many well-known authorities on this subject. Speller, Richardson, W. H. Walker, Handy, Burgess, Buck, Cushman, Aston, Unger, Storey, are only a few of them in this country, and there are many others in Europe. In addition, the American Society for Testing Materials has conducted much research work on copper steels, open-hearth steels, wrought iron, etc. In the tests conducted at Fort Sheridan, Illinois, they have shown the influence of copper seems to be to retard corrosion of the steel base. Most steels corrode due to oxide inclusions, and the personal view of the writer is that the copper is beneficial by making a sounder steel, rather than by any action in reference to the electro-chemical series of the elements.

Corrosion, rusting is due to chemical action in breaking down various chemical combinations. The simplest irons, and those containing the least impurities are the ones which should withstand the agencies of corrosion the longest. The prime reason why the old, ancient irons have lasted the way they have through the centuries


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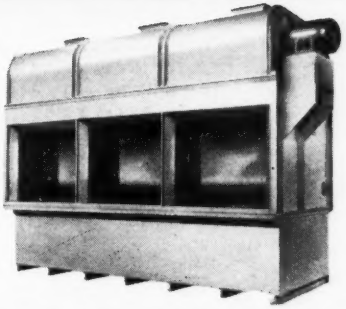

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is because they were pure, and because they contained practically no oxides or other inclusions, and in many cases they were in an atmosphere where there was little or no water present.

# Cleaning Lead Castings Prior to Plating

By Edward Finnie

LATELY, because of the shortage of zinc for domestic use, the zinc base die casting has been replaced by a 12 to 14 per cent antimonial lead casting. And platers have had to change their cleaning cycle to meet the change in casting metal.

So that platers might have some information on the cleaning procedures in use by manufacturers at the present time, this paper will summarize the cycles that have been used successfully.

There are several methods in use and all of them use different cleaning solutions—by that is meant different proprietary cleaners. However, the cleaners have this in common—they are mild in nature, similar to cleaning solutions used for zinc base die castings. Rather than name brands of cleaners, the designation will be as mild cleaners and if the reader wishes to know which brand of cleaner is being used in a particular cycle, the writer will be only too glad to give it to him.

Cycle No. 1
- Degrease.
- Clean cathodically in a mild cleaner at 160 deg. F. (change cleaner often).
- Rinse.
- Soak for 5 minutes in a 10 per cent sodium cyanide solution at room temperature.
- Transfer directly to high speed copper for 5 minutes at 35 amps. per sq. ft.
- Rinse.
- Acid dip.
- Nickel plate.

Cycle No. 2
- Degrease.
- Clean cathodically in a mild cleaner for 1 minute.
- Rinse.
- Dip in 5 per cent by volume acetic acid.
- Rinse.
- Copper strike in a rochelle salt copper bath at 2 volts or less for 10 minutes.
- Rinse.
- Acid dip.
- Copper or nickel plate.

Cycle No. 3
- Wash in washing machine.
- Clean anodically in a mild cleaner for 5 to 20 seconds.
- Rinse.
- Dip in 3 per cent sulfuric acid for 2 seconds.
- Rinse.
- Copper strike in a rochelle salt bath at 10 amps./sq. ft. for 5 minutes.
- Rinse.
- Copper or nickel plate.

Cycle No. 4
- Degrease.
- Clean in a mild cleaner cathodically.
- Rinse.
- Reverse current in a 55 deg. Beaume sulfuric bath (a nickel strip solution will work) for 15-30 seconds.

Rinse.
Copper strike for 15-30 seconds at 5 volts.

Cycle No. 5

Clean cathodically.
Rinse.
Soak in hot water for 5 minutes.
Transfer directly to nickel solution.

---

**"Protection for the Eyes and Face"** is the subject of a four-page circular just released by the Boyer-Campbell Company, 6540 Antoine St., Detroit, Mich.

It features 20 different models of face shields, all interchangeable in parts with the exception of two; meaning one shield which through interchangeability of windows covers any industrial operation. This means "less inventory," 12 different models for welding, as well as splash and heat protection. There is a ready reference to each of the illustrations, which gives complete information and specifications. Contained in only four pages is completely comprehensive information on this vital subject of industrial safety.

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**Oakite Pickle Control.** A new 12-page booklet concisely describing how certain recently developed Oakite materials provide several improvements from both results and costs standpoints in production pickling and neutralizing operations, has just been issued by Oakite Products, Inc., 20 Thames Street, New York.

In addition to presenting formulas and charts covering the use of Oakite Pickle Control as an acid inhibitor and its advantages in reducing hydrogen embrittlement, preventing over-pickling and reducing acid fumes, the booklet also gives detailed data on other Oakite materials for neutralizing.

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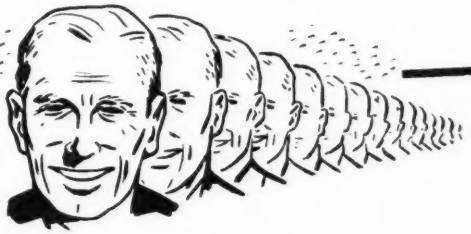

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# *Are You Increasing Your Output?*

## *Then Tighten Your Defenses Against Fire*

By WILLIAM H. EASTON
Technical Director, Safety Research Institute

INCREASED output means more men, more materials, more crowding and more haste. All this adds up to more fire danger! Don't forget what happened when World War I began. Just as soon as our factories began to speed up production, the number of industrial fires increased and the fire loss jumped way above the normal rate.

But there is no need of allowing history to repeat itself. If all the finishing industries take the proper precautions, heavy losses will be averted and the destruction of large stocks of material essential for defense will be prevented.

The first thing to be done, of course, is to make sure that all special fire hazards, such as dip tanks, drain boards, spray booths, and so on, are adequately safeguarded by automatic fire extinguishing devices. Such protection is becoming commonplace in finishing plants because it is largely foolproof. It is unfortunate that fusible links can't be attached to workers so they will function with the same automatic dispatch. Since this isn't possible, the next best thing is to train workers so they will know what to do and how to do it, in an emergency.

Automatic devices have only a limited range. Fire has the ability to cause most flammables to expand. Though the paint in a dip tank may be at a safe level, fire can cause it to overflow and the spilling liquid may carry fire out of reach of the automatic foam or carbon dioxide unit. Unless such a fire is knocked down quickly by workers equipped with portable fire extinguishers, damage and destruction may be turned loose.

So it is essential to teach workers in the finishing department not only how to prevent fire, but what to do when fire occurs. To carry out these measures effectively, some competent man should be made responsible for the plant's fire protection.

The duties of the plant fire chief include the following:

1. Study every fire hazard in the plant and provide for its adequate protection.

2. Install a sufficient number of approved fire extinguishers of proper types to control any class of small fire that may break out.

3. Draw up a fire prevention program for the plant and see that all workers understand its provisions and observe its regulations.

4. Train selected groups in each department in the use of fire extinguishers and in the operation and

care of automatic devices.

5. Train all workers in the proper steps to be taken as soon as fire breaks out. These steps include turning in an alarm, fighting the fire with hand fire extinguishers, manning hose lines, manning sprinkler valves, protecting materials and machinery in the vicinity of the fire, and ensuring the safety of workers not needed for fire duty.

6. Provide all watchmen with training in their duties in the event of fire. It may be desirable to install 20 or 40-gallon wheeled extinguishing units because these miniature fire engines give a single man large fire-fighting power.

It was formerly the practice in large plants to organize a central fire brigade. More recently, the tendency has been to supplement the central brigade with department brigades, each unit capable of taking care of fires and other emergencies that occur in the individual department.

The department foreman serves as brigade captain under the plant fire chief. Members of the brigade are selected from able-bodied men regularly employed.

Within the brigade, groups of men are trained for special duties. One detail handles the fire extinguishers, though all are instructed in the use of these appliances. Another detail lays fire hose from standpipes or hydrants. Still another squad moves stock or machinery that may be endangered by the fire, and after the blaze is extinguished this squad directs the "mopping up" operations.

Individuals or, preferably, teams of two men are assigned to shut off machine power, to close fire doors and open windows ventilating the fire area, and to stand by sprinkler shut-off valves.

When fire occurs, the brigade captain assumes direction of his men un-


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til the plant fire chief arrives on the scene. The chief has the responsibility of calling other brigades to the fire or of summoning the public fire department.

It is fundamental that a plan of cooperation between plant brigades and the public department be developed. In some communities, the NYA or WPA has been called upon to prepare maps of industrial plants or other high value property to enable the plant brigades and professional firemen to work out methods of combating fires under various conditions. Such preparedness saves valuable time when a fire does occur.

# New Wrinkle Obtains Patents on Methods of Drying Finishes and Required Apparatus

NEW WRINKLE, Inc., Mutual Home Bldg., Dayton, Ohio, has recently been issued two new United States Patents. One of these, No. 2236397, covers methods of drying finishes; the other, No. 2236398, pertains to apparatus required for drying finishes.

### Methods of Drying Finishes
(U. S. Patent No. 2236397)

This invention relates to a method for drying coating compositions, and more particularly to the method of producing Wrinkle finishes. However, it is equally adaptable for accelerating the drying of other types of coating compositions which dry to a hard, flexible film by oxidation, polymerization, evaporation of solvents or a combination of these actions.

Some of the featuers of the patented methods involved are: The producing of a Wrinkle finish where non-wrinkling oil vehicles, coated compositions are employed, and which ordinarily dry to a smooth, glossy surface; the improvement and acceleration of surface drying of coating compositions in order to produce a wrinkle or irregular surface film; to provide a controllable atmosphere for baking coated articles to cause the coating to dry to a hard, smooth finish, or irregular wrinkle finish as desired; the force air drying of coated articles by means of oxygen or ozone enriched heated air; and an improved method of accelerating the oxidation and polymerization of coating compositions applied to articles in a thin film so as to lessen the time for drying coating films to a dust-free finish.

### Apparatus for Drying Finishes
(U. S. Patent No. 2236398)

This invention relates primarily to a new type of machine for drying or baking coating films in the production of wrinkle finishes. However, it is equally as effective in the drying of all coating compositions which dry to a hard, flexible film by oxidation, polymerization, evaporation of solvents or a combination of these actions.

The features described in connection with the first patent, that of methods of drying finishes, are the direct result of the application of this patented apparatus which includes the use of an even distribution of heat and ultra-violet irradiation of the atmosphere in tunnel or rectangular type ovens.

These two United States patents have been assigned to New Wrinkle, Inc., Dayton, Ohio, by Folsom E. Drummond, inventor, also of Dayton.

# Efficient Use of Radiant-Heat

The advantages and disadvantages of the radiant-heat process of baking organic finishes were discussed recently from the standpoint of the finisher by G. Klinkenstein, vice-president and technical director of Maas & Waldstein Co., 438 Riverside Ave., Newark, New Jersey.

Radiant-heat baking is best suited for finishing large quantities of single, or similar, products, Mr. Klinkenstein said. It is not well adapted for the use of manufacturers who must bake many different kinds of products at the same time, or who are constantly changing the character of their products.

The process is a rapid one but it is economical only when the baking equipment is specifically designed for the work it is to do; if much of the energy radiated by the heating lamps is wasted, the cost of current may become prohibitive.

The finishing material used must also be selected with special care in order to take full advantage of the speed and other features of the baking process; to use a finish that bakes slowly means both a decrease in production and an increase in cost of finishing each unit.

A special problem arises due to the fact that black finishes bake more quickly under radiant heat than do white finishes of the same general composition, with other colors occupying intermediate positions. This means that, for a given radiant-heat installation, finishes of different colors must be so formulated that all will bake properly in the same time; otherwise, the baking equipment will have to be changed to suit each color.

When a radiant-heat baking oven is being installed, and also when the product or the finish to be baked in it is to be changed, the finish manufacturer should always be consulted in order to secure maximum operating efficiency.

The advantages of radiant-heat baking, where applicable, were summed up by Mr. Klinkenstein as follows: quick baking, especially suited to high-speed mass production, low installation and maintenance costs, ease and flexibility of installation, small space required, comfortable working conditions, and high degree of fire safety.


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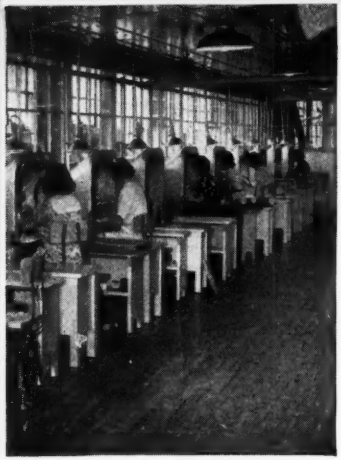

# News OF THE INDUSTRY

## OPM Issues Order to Galvanizers

E. R. Stettinius, Jr., Director of Priorities, has issued a statement pointing out that galvanizers who redistill zinc dross or skimmings are producers under the terms of the zinc priority order (M-11) and, as such, are subject to all the terms and requirements of that order, including the requirements for setting aside certain specified amounts of metal for emergency allocation by the Priorities Division.

Mr. Stettinius said that it has come to the attention of the Priorities Division that some galvanizers, who redistill their own dross and skimmings to recover the metal, have assumed that they are not producers under the terms of the order.

This assumption is incorrect, said Mr. Stettinius, pointing out that producers under the order are defined as: "any person producing Zinc as hereinbefore defined; **and also,** for the purposes of this Order, 'Producer' includes any person who produces such Zinc or others **under toll agreement.**"

Zinc is defined in the order as: "all grades of metallic zinc (spelter) produced directly from ores, concentrates, and other primary material or redistilled from scrap, including dross, skimmings, and ashes; all zinc oxide both lead-free and leaded; and zinc dust."

Any galvanizer who redistills dross or skimmings, which become available during galvanizing or other operations, is a producer under the order and, therefore, must comply with all the terms of the order applicable to producers.

## E. D. Horgan Now Roxalin General Sales Manager

The appointment of E. D. Horgan as general sales manager has been announced by the directors of the Roxalin

E. D. Horgan

Flexible Lacquer Company, Elizabeth, New Jersey.

Mr. Horgan is advanced from advertising and sales promotion manager which position he has held since 1937.

## DeVilbiss Training School

The DeVilbiss Company has announced the schedule of its Training School for users of spray painting equipment for the last six months of 1941.

The school is open to industrial finishers, painters, automobile refinishers, and other users of DeVilbiss equipment interested in learning the technique of spray painting and the use and care of spray painting equipment. It will be held at the company's Toledo, Ohio, plant.

Dates for the start of each training period are: September 22, October 20, November 10, and December 15.

Because of the limited size of classes, earliest possible enrollment is advised. DeVilbiss has already made special arrangements in Toledo hotels and boarding houses for the men attending the school.

Complete information regarding the Training School may be obtained by writing to the DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio.

## Norton Company Appoints Paul Fielden Director of Purchases

Norton Company, Worcester, Mass., manufacturer of grinding machines, grinding wheels, and other abrasive products, has announced the appointment of Paul Fielden as director of purchases. Mr. Fielden has been connected with the company 21 years as assistant credit manager and credit manager. He has been prominent in local and national credit men's associations and in 1937-1938 was president of the National Association of Credit Men.

John Miller, for a number of years assistant credit manager of Norton Company, succeeds Mr. Fielden as credit manager.

Marcus W. White retains the position of purchasing agent, which he has held with the company for many years.

## William W. Coffeen Appointed Research Associate

G. H. McIntyre, research director, Ferro Enamel Corporation, and chairman of the Research Associate Committee of the Porcelain Enamel Institute, announces the appointment of William W. Coffeen as research associate for the Porcelain Enamel Institute at the National Bureau of Standards. Dr. McIntyre's committee supervises the work of the research associate which was so ably carried on by Dr. Paul Smith during the past three years.

Mr. Coffeen has until recently been instructor in Ceramic Engineering in

William F. Coffeen

the Georgia School of Technology at Atlanta. He leaves this position to join the staff of the Porcelain Enamel Institute.


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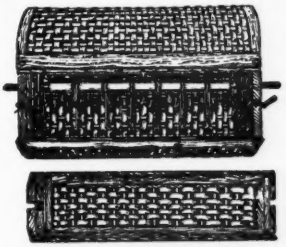


PLATING BARRELS

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Prior to his teaching, Mr. Coffeen served as research fellow at the University of Illinois Experiment Station for two years and later as ceramic engineer for the Canton Stamping and Enameling Company, Canton, Ohio, from June, 1937, to October, 1939.

Mr. Coffeen's experience in both the theoretical and practical problems of the porcelain enameling industry gives him an excellent background for the cooperative research work with the National Bureau of Standards which is sponsored by the Porcelain Enamel Institute.

## Sulphur Products Company Establishes Canadian Outlets

Liquid Sulphur is now being put up in Canada, according to a recent report by Wilfred S. McKeon, president of the Sulphur Products Co., Inc., Greensburg, Pa., lately returned from Canada where he has arranged for his company to have its product made there. This product will be handled by Clark Industrial Supplies, Ltd., 3194 Dundas, West, Toronto; Prescott & Company, 774 St. Paul St., W., Montreal; and Lea Products Co., Inc., 1009 Cote St., Montreal.

Liquid Sulphur is being put out in Canada the same as in this country so that it can be used for stripping copper as well as for oxidizing.

## Philadelphia Quartz Company Celebrates 110th Anniversary

The Philadelphia Quartz Company, 121 S. Third St., Philadelphia, Pa., recently celebrated the 110th Anniversary of its founding. From its humble beginnings in 1831, this company has grown until it occupies nine plants, located at Chester, Pa., Anderson, Ind., Baltimore, Md., Buffalo, N. Y., Kansas City, Kans., Rahway N. J., St. Louis, Mo., Utica, Ill., Jeffersonville, Ind., and is affiliated with Philadelphia Quartz Company of California, Ltd., who operates plants at Berkeley and Los Angeles.

## R. D. Yoder Transferred to Cincinnati Office

R. D. Yoder has been transferred from the Milwaukee headquarters of Cutler-Hammer, Inc., pioneer manufacturer of

R. D. Yoder

electrical control apparatus, to the company's Cincinnati office in the American Building.

As stated by Mr. B. M. Horter, sales manager, the addition of Mr. Yoder to the Cincinnati force is necessary to meet the rapid increase in industrial activity and the consequent upswing in demand for C-H products in this area.

## Crowley and Bennett Technical Consultants

A new firm of technical consultants, Crowley and Bennett, was recently announced. The principals, Clyde A. Crowley and Harry Bennett, are well-known in their respective fields. The former is well-known for his work in electrochemistry and many other fields; the latter as editor-in-chief of the "Chemical Formulary" and for his work on emulsions, special formulae, and other modern chemical developments.

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The Chicago headquarters is at 6803 N. Clark St. The Eastern branch is at 228 King St., Brooklyn, New York.

The Chicago laboratories are especially equipped for electro-chemical, lubrication, metallographic and other highly specialized problems.

Both of the principals are well-known as "trouble-shooters" and solvers of intricate application problems where "time is of the essence."

## Manning-Bowman's Peacock Plate Discovered by College Student

Eight years ago a young college student at the University of Kansas was working on a chemistry thesis for his master's degree when he discovered that strange things were happening in the laboratory. In trying to develop color for metals by electro-plating, he accidentally hit upon a lovely flecked finish, magnificently colored and unlike anything ever seen before.

Today the experiments of this college student have resulted in Manning-Bowman's new Peacock Plate which this Connecticut firm is now turning out in radiantly beautiful gift items, including bowls, vacuum jugs, ash trays and table accessories. But it was a long step from university laboratory to the factory. Research was needed before this process would prove practical for industrial purposes. Fortunately, the thesis was brought to the attention of United Chromium, Inc., who recognized the tremendous possibilities of this new color plate and engaged its inventor, Dr. Jesse Sterrick, to develop it further in the company's laboratories.

Manning-Bowman was one of the first to realize the appeal of this unique color finish and to license the process from United Chromium. But pioneering with this new process was not easy, for while the company started manufacturing Peacock Plate six months ago, it's only within the last month that it has been able to supply the demands of department stores and jewelry shops throughout the country.

Peacock Plate takes its name from the swirled pattern and rich hues of a peacock's feathers. Like chromium, it's an electro plating process, but while chromium calls for nine operations, the Peacock finish takes 33. But the results are worth the labor for there is no colored metal finish on the market today that has the iridescence and lasting brilliance of Peacock Plate.

## Autovent Purchased by Herman Nelson Corporation

The Herman Nelson Corporation, Moline, Ill., recently announced that it purchased the entire assets and business of the Autovent Fan and Blower Company, Chicago, Illinois.

The business will be operated as the Autovent Fan and Blower Division of The Herman Nelson Corporation. The complete line of Autovent products will continue to be manufactured in the Autovent Division in Chicago.

Included in the Autovent line is a complete range of sizes of centrifugal blowers from 6 in. in diameter to 72 in. in diameter, in both forwardly and backwardly curved blade designs and a complete selection of propeller exhaust and ventilating fans from 12 in. in diameter to 72 in. in diameter.

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**IMPROVE YOUR FINISH 100%**

MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

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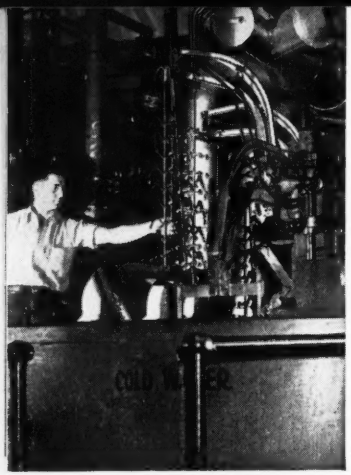
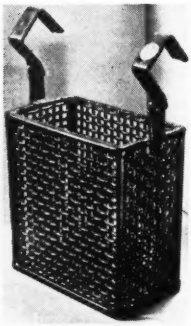


# New PLANT EQUIPMENT AND Materials

## Hanson-Van Winkle-Munning Anode Scrap Baskets

A new type of basket for handling scrap anodes has been developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturer of electroplating equipment and supplies. Because of the present shortage of metals, the efficient use of scrap is of vital importance to the electroplating plant.

The Hanson - Van Winkle - Munning rubber covered scrap anode basket is furnished with two hooks, allowing the basket to be hung on anode rods in still tanks and plating barrel tanks. A new anode is inserted in the basket and hung on the anode bar. The anode stubs are placed in the basket around the new anode allowing this metal to be used.



Hanson-Van Winkle-Munning Anode Scrap Baskets

The basket is made of steel wire with proper reinforcements at the top, at all ends, and at the bottom. The steel mesh used is welded to the frame and the entire basket is rubber covered. The unit is rugged in construction and neat in appearance.

The baskets can be used in solutions where temperature does not exceed 180 to 190 deg. F. Almost all plating solutions are operated below this temperature.

The hook for the scrap anode baskets can be furnished four or five inches long as desired, and the baskets can be made to dimensions specified. The following are considered standard sizes: 9 in. long by 18 in. deep by 4 in. wide; 12 in. long by 24 in. deep by 4 in. wide; 16 in. long by 30 in. deep by 4 in. wide; 20 in. long by 40 in. deep by 4 in. wide. These dimensions are inside measurements, the outside width being approximately one inch additional.

The Hanson - Van Winkle - Munning Company is also in a position to furnish anode bags for these baskets.

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## Protective Coatings for Aluminum Castings

Since aluminum castings, particularly those which are subjected to low temperatures, are readily attacked by condensation of water vapor, the Glyco Products Co., Inc., 230 King St., Brooklyn, N. Y., has developed and is now marketing a material for protecting such castings. According to this company, it has been found that an emulsion of paraffin wax and Flexo Wax C, made with Diglycol Stearate S, can be easily applied to the castings by spraying.

A coating of this material is said to leave a film of water repellent wax which completely protects the metal parts. The paraffin emulsion has also been found to give satisfactory results on extruded parts, alumilited sheets, and zinc and tin plated parts.

# DIFFICULT ?

## ANSWER—NOT When FINISHED AUTOMATICALLY on PACKER-MATIC

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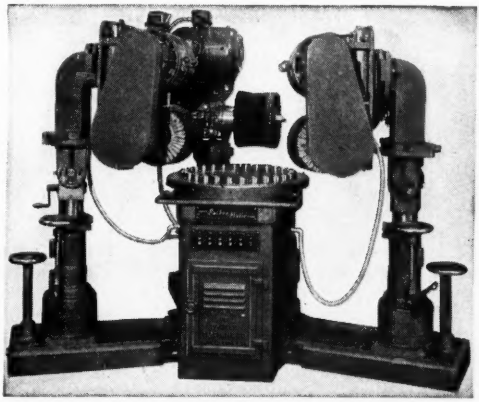

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Parts of odd shapes with many angles and contours are Polished and Buffed — Automatically — on PACKER - MATIC by hundreds of manufacturers and in each case the results are Increased Production and a Saving in Finishing Room Costs.

PACKER-MATIC produces a consistently uniform finish of the color you desire. PACKER-MATIC has centralized control! Work table, wheel motors, loading and unloading regulated and controlled from operator's position.

PACKER-MATIC is made in a type to accomplish the result you want in your "difficult to finish" part. A proposal based on a factory time study will gladly be given—SEND sample part and finish required.

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THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.

## Roxaprene

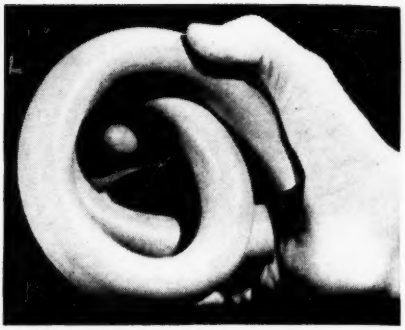
A timely answer to the problem of impeding corrosion is said to be given by Roxalin Flexible Lacquer Company, Box 716, Elizabeth, N. J., in the material known as "Roxaprene," a corrosion resistant speed synthetic. Roxaprene can be applied as a paint finish in general use by dip, spray, or roller coat, thus requiring no special equipment for application. It air dries quickly or may be force dried. This enables a considerable reduction in handling.

Roxaprene can be applied on products such as air conditioning equipment, motor trucks, bottle caps, fans, blowers, pumps, and special machinery.

## Goodrich Lightweight Hose

A new lightweight air hose so flexible that the ½ in. size can be bent to a three inch radius without collapsing or cutting off the air supply has been announced by The B. F. Goodrich Company, Akron, Ohio.

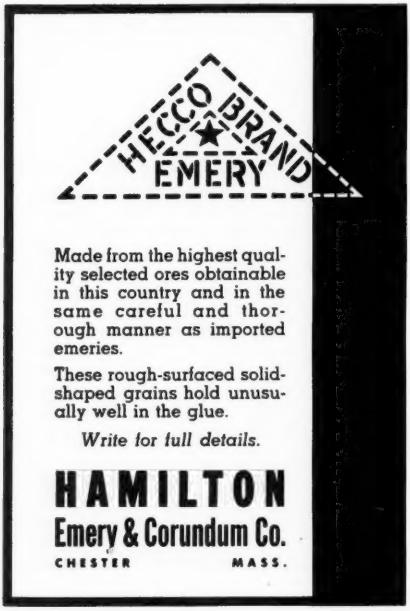
The hose has been designed so that strength and efficiency are combined with maximum weight and ease of handling and should have particular appeal to shop men handling pneumatic tools, the company's announcement states.



Goodrich Lightweight Hose. The ½ in. size can be bent to a three inch radius without collapsing or cutting off the supply of air.

Made in a light gray which stands out prominently and is easy to see by the operators of shop trucks, the new hose is stocked in ½ and ¾ in. sizes. Of two braid construction, the hose can easily withstand working pressures of from 80 to 125 pounds.

Compound of the tube is of oil resistant rubber, with excellent heat resisting characteristics. The tube does not flake or clog tools. Yarn reinforcement affords a safety factor of more than five to one under a working pressure of 125 pounds, while the golden ply insulation has been especially developed to assist in flexibility and resistance to kinking.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These rough-surfaced solid-shaped grains hold unusually well in the glue.
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HAMILTON
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## Westinghouse Water and Dust Tight Circuit Interrupter

Especially designed for disconnecting or interrupting of circuits in outdoor, damp, wet, or dusty locations, a new non-automatic enclosed De-ion circuit interrupter has been announced by Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. The interrupter is used in industrial plants, commercial establishments or any place where water or dust tight non-fusible switches were formerly used.

Enclosures are furnished in either cast aluminum or cast iron, both of which have an aluminized finish. A closely machined fit between handle

shaft and bushing with heavy rubber gaskets between enclosure and cover make them water tight. Current ratings range from 50 to 600 amperes, 2 or 3 poles, at 250 to 600 volts a.c. and 125/250 to 250 volts d.c.

A high interrupting capacity is provided to interrupt a circuit adjusted for 5,000 to 10,000 amperes depending on frame size. De-ion arc quenchers confine, divide, and extinguish arcs almost instantly as the contacts open, thus prolonging contact life. "Quick make," "quick break" action is obtained by a toggle mechanism operating the contacts.

50-ampere, 3-pole, 600-volt a.c. Enclosed Circuit Interrupter designed especially for use in locations exposed to dust or water spray.

## Oakite Deodorant No. 1

Due to speeded-up manufacturing schedules and greatly enlarged personnel in many plants, the problem of maintaining proper sanitation standards in wash-rooms and related plant facilities to guard against infection and to protect employee health, has become increasingly important to plant managers and maintenance superintendents.

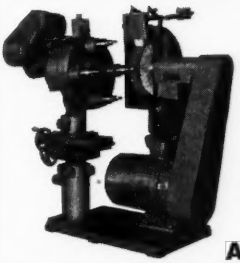
Of timely interest is a development known as Oakite Deodorant No. 1, a triple-action material combining deodorizing, detergent and disinfecting properties which has been designed to simplify this problem by affording an effective means, in one operation, of carrying out sanitation routines more easily and within specified time and cost limits.

A dry, white, free-flowing powder, used in cold water, this material is reported to be designed solely for use in connection with deodorizing and cleaning washrooms, shower stalls, "first aid" rooms, lavatories and locker rooms. Odorless itself, the material not only dissipates and neutralizes odors without masking or "covering up" one odor with another, but also provides effective dirt and grime removal action on cement, tile and porcelain surfaces. In addition, its disinfecting properties are said to help provide added protection against harmful organisms.

## Leeds & Northrup Glass-Electrode pH Indicator

Though simplified and stripped to essentials for low cost and easy operation, the new Glass-Electrode pH Indicator manufactured and marketed by Leeds & Northrup Company, 4934 Stenton Ave., Philadelphia, Pa., offers as much accuracy as is needed in many laboratory measurements and in practically all plant tests. It retains full accuracy up to 85 deg. F. in atmospheres of 95 per cent relative humidity. Measurements


Get Hep to This for Polishing and Buffing! Faster and Cheaper



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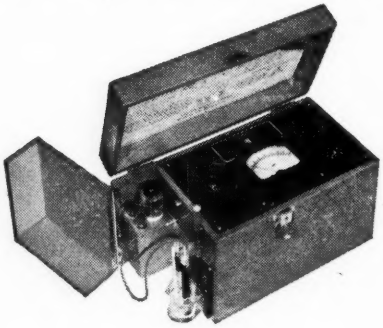
can be made consistently within its limit of error of adjustment, ± 0.1 pH.

Light in weight well balanced, it includes everything necessary for measuring pH. Speed and convenience are inherent in its simple construction. Adjustments take but a moment. Measurements are made simply by pouring a sample into its self-contained beaker, and reading pH directly from the meter scale.



Leeds & Northrup Glass-Electrode pH Indicator

Adequately shielded, the instrument embodies a rugged deflection meter, and a thermionic amplifier of high stability. Manual temperature compensator (0 to 50 C. with one-degree divisions) eliminates computations, saves time, prevents errors. Factory filled and sealed electrodes are highly stable. Strong, well-finished, mahogany case, of special construction, stands severe use and high humidity.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INDUSTRIAL CHEMICAL PRODUCTS CO.

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Fort Wayne Chicago Cleveland


## George Surface Enamel

A surface coating which can be dipped or sprayed and baked has been placed on the market by The P. D. George Co., 4153 Bingham St., St. Louis, Mo. This finish has been developed as a substitute for metal finishes which have been rendered impractical and unavailable due to defense demands.

George Surface Enamel is available in all colors, including white, and is said to have remarkable draining characteristics, unusual gloss, and high color retention. The finish will not scratch easily and one coat is said to cover a surface with a smooth, wax-like finish which will stand extreme wear and weather abuse.

George Surface Enamel can be thinned with oleum spirits and is said to bake out in 15 minutes at 300 deg. F.

## Porex Filter

Representing what is described as a new technology in control of filtration and flow of liquids and gases, a porous metal product known as "Porex" was recently introduced by Moraine Products Division of General Motors Corporation, Dayton, Ohio. "Porex" has two principal functions which are to remove foreign materials from fluid, such as oil, and to alter the characteristics of gases by diffusion, reducing pressures and controlling flow rates.

The new Porex filter and diffusing material is a development of the company which introduced the well-known "Durex" oil impregnated bearing. Porex is manufactured from powdered metal subjected to a series of processing operations.

Applications for Porex, the announcement said, are found in almost any appliance or piece of industrial equipment


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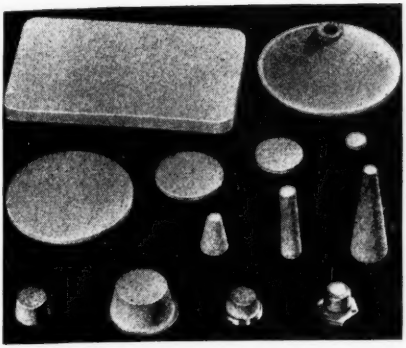
KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.



Porex Filter Material

involving the flow of gases or liquids. These uses are found in pumps, absorbers, paint sprayers, premixed gas burners, and other devices.

This new filter and diffusing material, for example, is described as valuable in separating oil, moisture and solids from air supplied to paint spraying equipment.

Among the features of Porex, according to Moraine Products engineers, are its physical characteristics, such as chemical composition, structure, porosity, strength and ductility, which may be varied within certain limits to suit specific applications. Similar variations may be accomplished in its size and shape. Standard shapes now available are discs, sheets, cylinders and truncated cones, while special shapes also are obtainable.

One important and unique feature of Porex is its ability to be bonded to steel and copper. In this way, Porex can be made an integral part of solid metal which may be machined, ground, bored, threaded, or processed for individual requirements.

When used as a filter, Porex provides conditions which permit high flow rates, low flow restriction and a high degree of surface clogging before efficiency is reduced. Utilized as a diffusing plate, Porex offers low flow restriction and uniform, controlled porosity.

## Amron

A new air dried finish to be known as Amron has been placed on the market by The United States Stoneware Company, 60 E. 42nd St., New York City. Amron is a synthetic resin lacquer made from a vinylite base and incorporates a number of features not previously available in this type of finish. Amron possesses all the well known features of vinylite finishes plus excellent adhesion without the necessity of a bake.

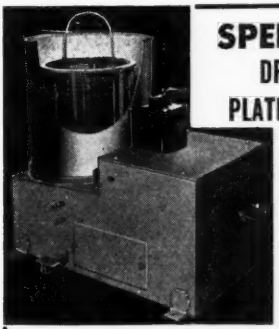
Amron primer contains metallic corrosion inhibiting elements which prevent rusting from the underside of the lacquer film.

Amron lacquer films are said to be elastic, exceedingly tough, waterproof, and highly corrosion resistant. Amron dries very rapidly and if desired, the final set may be hastened by forced drying.

If unusual hardness of the film is desired, Amron finishes may be baked at high or low temperatures. Amron finishes are available in any color including clear lacquer. They may be had in non-toxic form for use with products coming in contact with foods or pharmaceuticals.

## Drum-Lift

The Falstrom Company, Main Ave., Passaic, N. J., has placed on the market a heavy duty container handling device

**SPEED UP DRYING PLATED WORK**

*with*

**THIS ONE-MAN MACHINE**

**Increase factory output . . . Lower finishing costs. Let this modern, inexpensive machine solve your drying or lacquering problem.**

**Fully equipped with reversing drum switch, foot brake, ¾ H.P. motor, V belt drive, it is of all steel electric weld construction occupying 18" x 32" floor space. Gas or steam heating unit optional.**

**WRITE FOR COMPLETE DETAILS.**

**DELLINGER MFG. CO.**

**729 N. Prince St. Lancaster, Pa.**

Drum-Lift

to be known as "Drum-Lift." This drum handling unit is said to provide the means for lifting, moving, rotating, and tilting most types of drums.

To lift a drum standing on its end on the floor, the lift is brought into position and the drum cinched in the lift saddle. This saddle is connected by links to the ends of a U-shaped handle which is brought down to raise the drum from the floor. In this position the lift rolls on its wheels, the handle being used for steering. Farthest downward movement of the handle places the drum at its highest position where it can be rotated and tilted to dispense its contents. When the drum is released after tilting, it returns to upright condition to prevent dripping of contents.

Lift accommodates barrels or drums of approximately 55 gallon capacity. Two types are available—drum type for parallel side drums; barrel type for curved drums. Both types are equipped with automatic safety locks. Width between wheel centers, 30 inches. Maximum clearance from floor to bottom of drum in vertical position, 11½ in.; in horizontal position for pouring, 18 inches.

## Maskote Enamel

The U. S. Chemical & Lacquer Co., 16710 E. Nine Mile Rd., East Detroit, Mich., has placed on the market a protective coating to be known as Maskote Enamel. Maskote Enamel is designed to provide a protective coating for the back of articles to be electroplated for the purpose of saving nickel or other electrodeposited metals.

Maskote Enamel can be sprayed and baked, and according to the manufacturer, will resist all plating solutions and cleaners. The coating is said to remain a permanent enamel after being subjected to the various cleaning and plating solutions encountered in the plating cycle. Maskote Enamel is light gray in color to match the plating as nearly as possible.

## Century Explosion-Proof Motor

Constructed to meet the specifications of Underwriters' Laboratories, Inc., for Class I, Group D installations in places where the surrounding atmosphere is charged with explosive quantities of acetone, alcohols, gasoline, lacquer, naphtha, natural gas, petroleum, or solvent vapor, the explosion-proof motor


**BLACK for Iron and Steel**

*Original, low temperature, patented method*

One salt; one bath; one control; one operator. Protects and beautifies; lowers finishing costs; speeds production.

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**AND SAVE YOU MONEY**

Each shipment—one drum or a carload—receives PROPER and SEPARATE TREATMENT.
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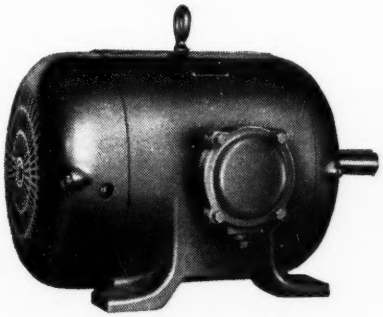
LISTER AVE. & BROWN ST., NEWARK, N. J.
*or*
HAMMOND CHEMICAL SERVICE, Inc.
241 BRUNSWICK ST. HAMMOND, IND.

shown herewith has been brought out by the Century Electric Co., St. Louis, Mo. According to the manufacturer,



Century Explosion-Proof Motor

the motor is so designed that it will resist the pressure of an explosion of any of the above gases, and so on, should one occur inside the motor, thereby eliminating the possibility of an explosion in a similar atmosphere outside the motor.

## Electrobrite

Increased smoothness and reflectivity of polished stainless and rustless steel is said to be obtained when a compound known as "Electrobrite" which is being marketed by The Franklin Oil & Gas Co., Box 127, Bedford, Ohio, is added to the electropolishing bath. Use of the compound is said to allow reduction in current density and operating voltage of baths, and to eliminate foaming and fuming. Irregular or round shapes are said to be polished uniformly.

Electrobrite is available in various grades depending upon the current and temperature used and finish desired.

## Wilbur & Williams Light Gray Totrust

A finishing material which is said to have the same appearance as aluminum paint and approximately the same light reflection, to be known as Light Gray Totrust, has been placed on the market by The Wilbur & Williams Co., Park Square Bldg., Boston, Mass. In addition, the manufacturer states that rust can now be stopped at its source by the use of Totrust Light Gray which is a penetrative paint with unusual protective qualities.

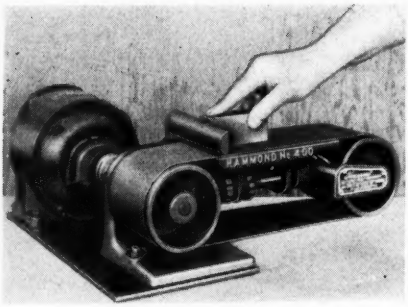
The oil vehicle embodied in Totrust covers penetrating pin holes and rusted pits in the metal and expels any moisture which may be present. The oil vehicle surrounds and effectively isolates particles of rust and forms a hard, durable, and yet flexible film.

Light Gray Totrust is odorless and one gallon is said to cover approximately 800 to 1,200 sq. ft. The material is not affected by temperatures ranging from 100 deg. F. below zero to 800 deg. F. above zero.

## Hammond "400" Belt Surfacer

The Hammond "400"—a new bench-type belt surfacer for wet or dry buffing, surfacing or polishing—is now being manufactured by Hammond Machinery Builders, Inc., 1622 Douglas Avenue, Kalamazoo, Michigan.

The "400" is designed to reduce the number of rejects in lots of cast or moulded pieces, and to facilitate finishing work formerly done by hand. Ver-



Hammond "400" Belt Surfacer

satility in the type and number of different materials successfully finished is an outstanding feature of the machine. Plastics, stainless steel, lead, aluminum, and many other types of materials may be finished on the "400." With the proper abrasive belt, the machine may be used for rough work such as removing sprues and flash from rough castings. With a different type belt, a fine luster may be developed on glass, pottery, plastics and like materials.

Simply, but sturdily, built, all parts of the Hammond "400" conform to machine tool specifications. Base of the machine is heavy cast iron. Belts, of which a wide variety may be used, are 4 in. x 35 in. endless type, running over 4 in. Drive and Idler pulleys with 4½ in. face. Each pulley is dynamically balanced and turns over dustproof ball bearings. The belt is adjusted to proper position on the pulleys by means of two opposing thumbscrews. For positioning work against the belt, a work rest, easily adjustable on a segment, is mounted on the frame slightly forward of the drive pulley and projecting over the belt.

Power is furnished either by direct or V-belt drive from a 1/3 H.P. motor operating at 1,725 r.p.m. The Hammond "400" operates in any position between horizontal and vertical, pivoting on center of the drive pulley and locking into position by means of a positive clamp on the base of the machine.

For wet surfacing operations, a sheet metal casing is fitted around the machine. Coolant is piped to the belt by a tube inserted through the side of the hood, ending in a spray nozzle which distributes coolant fluid evenly across the belt.

## Electro-Ebonol

The Enthone Company, 440 Elm St., New Haven, Conn., has announced a new process called "Electro-Ebonol" for electrolytic blackening of almost all metals, including aluminum, steel, stainless steel, zinc, cadmium, nickel, silver, gold, lead, tin, and various alloys. The manufacturers claim their process to be particularly important in view of the shortage of nickel salts for black nickel solutions. The Electro-Ebonol deposits are stated to be harder, blacker, and more adherent than black nickel.

Electro - Ebonol salts are supplied ready for use and a solution of 12 oz. per gallon of water is used, operated from 140 to 190 deg. F. Current densities required are low, ranging from ½ to 5 amperes per square foot. Voltage, from 1 to 2, depending upon the setup. Anodes may be of carbon, or stainless steel. Tanks may be of wood, stainless steel, ceramic ware, or Monel metal.

The work is cleaned for blackening similar to the cleaning preceding plating and the black coating is deposited very rapidly, in from 30 seconds to

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Nalco Dritherm Lamps are the carbon filament type...proved for years in therapeutic and industrial practice as providing maximum emanation of infra-red ray within the desirable penetrating band. Made only by—
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THE ROBERTS ROUGE CO., Specialists in manufacturing thoroughly dependable Gold, Sterling and Silver Plate Rouges; Stainless Steel, Chrome and Crocus Compounds. STRATFORD, CONN.

three minutes, depending upon current density. The throwing power is claimed to be very high, better than any metal plating solution. Parts will be blackened by the manufacturer for examination or test.

## AO Protectocote

A new protective apron, completely different from the conventional oiled duck, rubberized cloth and "synthetic" types, has been announced by American Optical Company, Southbridge, Mass. The material of this new AO Protectocote provides exceptionally effective protection against acids, oils and greases.

AO Protectocote

In addition to protecting the worker's clothing, the Protectocote guards his person against contact with industrial compounds and liquids that cause skin diseases and discomfort. It resists heat, thus will not burn. Although very tough, it is also very light in weight, assuring both comfort and durability. It is made in two styles and 11 sizes.

The Protectocote resists the following: oils, tar, greases, acids, chemicals, paints, varnishes, lacquers, cutting fluids, solvents, kerosene, gasoline, creosote, naphtha, caustics, and alkalies.

## Mead "Bandsander"

A machine for use in carving, shaping, sanding, and polishing wood, plastic, and metal is now being marketed by Mead Specialties Co., 15 S. Market St., Chicago, Ill. The machine, which is known as the "Bandmaster," is said to cut fast and clean on curves, inner edges, and so on.

The Bandmaster is equipped with an abrasive band 45 in. long which passes the work at a rate of over 1,600 ft. per minute. The flexing of the band as it passes over the upper and lower wheels, together with the speed of travel, causes the band to automatically clean itself of any particles of material it may carry from the work.

The base of the Bandsander is 6 x 12 in., and the machine is of a suitable height for use on the average workbench. It is designed to operate at approximately 1,750 r.p.m. on motors of 1/6 to ¼ h.p. By means of step pulleys, the machine can be operated faster or slower, according to the nature of the work.

The table tilts from the normal horizontal position to a 45-deg. angle with the band, thereby permitting a wide range of beveling operations to be performed on curved or straight edges. The throat (distance from front part of band to supporting pedestal) of the Bandsander is 8½ in. deep, thus making it possible to work to the center of pieces up to 17 in. in width. Bands of any width up to 1 in. may be used and are quickly interchangeable.

The backstop which projects through the table directly behind the front part of the band is quickly removable by


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**RUST INHIBITIVE**

Formulated specifically for the following properties:

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2. Water-whiteness
3. Tenacious adhesion
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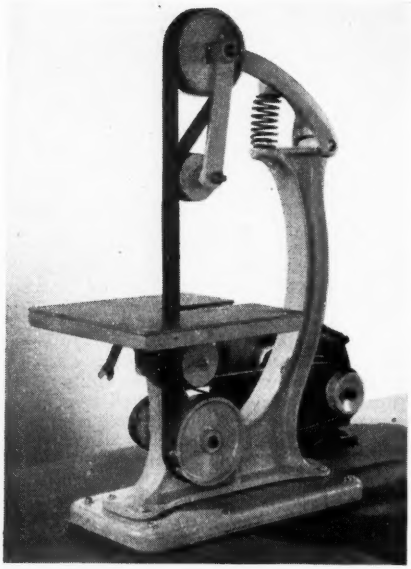
is used and recommended as a clear coating for hand tools, machine tools, hardware and wherever a clear protective coat for bright metal is required.

**The Varnish Products Co.**
**5208 Harvard Ave. Cleveland, Ohio**



Mead "Bandsander"

means of two screws located under the table, thus enabling backstops of different widths or shape to be quickly substituted, if desired. The table top is a sheet of hard-faced tempered "Preswood Masonite."

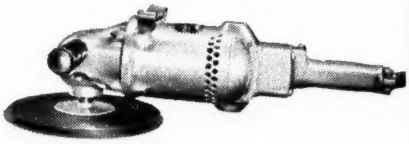
## Black & Decker 9-In. Heavy Duty Sander

Designed for constant production-line use with 9-in. abrasive discs, the heavy duty sander illustrated herewith has been brought out by The Black & Decker Mfg. Co., 720 Joppa Rd., Towson, Md. The unit is said to be ideal for use with wire cup brushes and saucer grinding wheels for right-angle grinding.

Features of the sander include a fast spindle lock for the quick changing of pads and abrasive discs, and spiral bevel gears, specially designed for full, smooth power with a minimum of friction and noise. The unit is powered by means of a universal motor, operating on 110 volts, either a.c. or d.c. The sander is also available for operation on 220 or 250 volts. The switch and commutator are sealed against abrasive dust and grit, and the switch, being of a plunger-operated type, is protected against accidental turning-on.

The Black & Decker 9-In. Heavy Duty Sander is full ball bearing equipped, with bearings grease-sealed against dust and dirt. The unit has a pusher-type steel fan which forces straight-line ventilation through ample vent slots, and is equipped with an adjustable side handle for right or left-hand use. The sander is also provided with a strap metal stand.

Specifications of the Black & Decker 9-In. Heavy Duty Sander are as follows: diameter of sanding pad, 9 in.; spindle, $\frac{5}{8}$ in. diameter, 11-thread; no-load spindle speed, 5,000 r.p.m.; net weight, 18¾ lb.; shipping weight, 25 lb.; overall length (not including pad), 19½ in. Standard equipment includes a spindle lock, 9-in. moided rubber pad, three 9¼-in. abrasive discs (one coarse, one medium, and one fine), clamp washer,



Black & Decker 9-In. Heavy Duty Sander

detachable side handle, strap metal stand, 3-conductor cable and plug (third wire for grounding), and universal motor.

## Kem Machine Tool Enamel

The announcement by the Sherwin-Williams Company, Cleveland, Ohio, of

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Write for Interesting Details TODAY!
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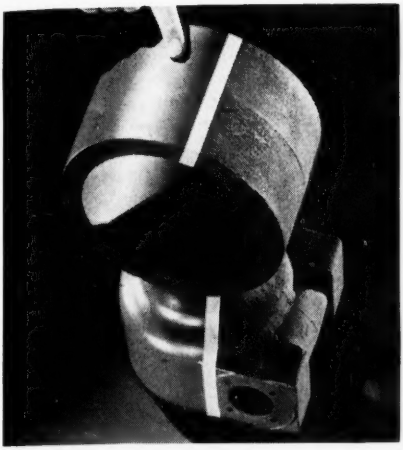

Typical Machine Tool Casting, Shown in its Original Form on the Right Side and Finished with Kem Machine Tool Enamel, Four Coats, on the Left

a new, fast synthetic enamel for machine tool castings is expected to be of interest to manufacturers who are either not set up for lacquer work or who need a more resistant finish. Known as Kem Machine Tool Enamel, the finish is said to cut finishing time on large tools to the minimum and is said to offer maximum resistance to cutting compounds.

The new Kem finishes can be applied in 5¾ to 8½ hours, four coats, thus permitting work to be shipped the same day it is finished and assembled. A typical drying schedule is as follows:

| | Drying Time |
|---|---|
| First: Spray or brush coat Zinc Chromate Primer | 15 to 30 min. |
| Second: Machine Filler | 4 to 5 hrs. |
| Third: Kem Sealer Gray | 15 to 30 min. |
| Fourth: Kem Machine Tool Gray | 15 to 30 min. |
| Dry and crated | 1 to 2 hrs. |
| **Total** | 5¾ to 8½ hrs. |

## Fluorescent "Controlenses"

The Holophane Co., 342 Madison Ave., New York, N. Y., is now manufacturing three prismatic glass lenses to be known as Fluorescent "Controlenses." The Controlenses, when used with fluorescent fixtures meeting the optical design specifications established by the Holophane Engineering Department, are said to produce three basic lighting distribution patterns.

The first lens, which is known as the Intensive Controlens, produces the distribution of light most commonly used in both commercial and industrial interiors—normal "uniform spacing" lighting of horizontal surfaces in rooms of normal height.

The second lens, the Concentrating Controlens, produces a rigidly confined focusing type of light distribution. This lens has several common applications, such as accent lighting, general illumination from great mounting heights, and "offset beam" lighting.

The third lens, which is designated as the Extensive Controlens, is particularly adaptable for areas where the lighting of vertical surfaces is desired or in low ceiling areas to permit economical wide spacing of lighting units.

The fixtures used in connection with the Holophane Controlenses are for three types of installations; namely, re-


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3. Positive rust control by leaving a microscopic deposit of iron phosphate.
4. Slightly etches the metal insuring perfect bond for finish coating.

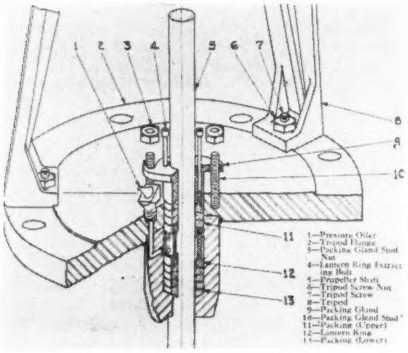
*Write for Corrosol No. 6 Bulletin*

**INTERNATIONAL RUSTPROOF CORP.**
**12507 PLOVER AVE., CLEVELAND, OHIO**

cessed flush-with-the-ceiling, "close-up" to the ceiling, and for suspension mounting. The fixtures are designated as "Controlescent" fixtures.

## Lantern Ring Puller Features Lightnin Mixer

A built-in Lantern Ring Puller has been designed for "Lightnin" tripod mixers which are now being manufactured by Mixing Equipment Company,




Drawing illustrating the design of a new Lantern Ring Puller

Inc., 1038 Garson Ave., Rochester, N. Y. Operation of the Puller is said to be extremely simple.

When the upper packing is removed, the puller bolts can be threaded into the lantern ring. Compressor nuts are used below the compressor ears to pull out the entire assembly. No special tools are required and the entire operation requires but a minimum of time.

The Lantern Ring Puller construction is well adapted to most types of stuffing boxes where repacking is a problem.


## Want to Improve Your Paint Job?

At no extra cost you can give your customers a better, longer-lived paint job. RUSTICIDE "50" not only cleans but also mildly etches and effectively rust proofs the surface. This inexpensive, non-toxic liquid is easy to handle, removes grease and rust, leaving an ideally toothed surface ready for immediate painting. Write us discussing your operation and we will send complete data. Rusticide Products Co., 3125 Perkins Ave., Cleveland, O. Est. 1920.


**Dust Control.** A complete story of dust control in words and pictures by means of Roto-Clone dust control equipment is now being issued by American Air Filter Company, Inc., 702 Central Ave., Louisville, Ky. Copy free.

**Sellstrom Eye and Face Protectors** is the subject of a 36-page, profusely illustrated catalog now being distributed by the Sellstrom Mfg. Co., 645 N. Aberdeen St., Chicago, Ill. Among the eye and face protecting equipment covered are various types of helmets, hoods, paint sprayers' masks, shields, goggles, respirators, glasses, gloves, and so on.

Copy of Catalog No. 19 free upon request.

**Oakite News Service.** The important part that proper cleaning and surface preparation play in electrolytic resistance spot-welding of aluminum and its alloys in connection with aircraft production is described in an interesting two-page feature article appearing in the May-June issue of Oakite News Service, nationally distributed house magazine of Oakite Products. Inc., 20 Thames St., New York, New York.

Copies of this illustrated, concise article are available to production executives upon request.

**DeBothezat Ventilating Equipment Catalog.** A new man cooler, especially designed for reducing fatigue of workers who are exposed to radiant heat from ovens, furnaces, forges, and molten metal, has recently been announced by the DeBothezat Ventilating Equipment Division, American Machine Metals, Inc., East Moline, Illinois.

Called the "Hy-V" Air Jet, the new man cooler is column mounted and adjustable to blow in any direction. It projects a blast of cooling air in a concentrated stream to remote spaces without the aid of ducts.

A copy of this catalog will be sent free upon request.

**Ra-Tox.** Shading for factories is growing in importance this summer with rapidly expanding production. More than ever skilled workers need

protection from sun, heat, and glare. Factory owners and managers have come to realize how essential are proper lighting, shading, and temperature to speed and precision. The Hough Shade Corporation, Janesville, Wis., with years of experience in factory shading, has recently issued a new bulletin illustrating various designs for all types of industrial sash, including skylights and monitors. Tests show that 30 per cent to 40 per cent more light and air can be admitted while reducing heat and glare to appreciable proportions.

A copy of this bulletin will be sent free upon request.

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**Tri-Clad Induction Motor.** Catalog GEA-3580 now being issued by the General Electric Co., Schenectady, N. Y., gives many interesting highlights on the design, construction, and application of the General Electric line of Tri-Clad motors. Well illustrated, concise and graphic in style, this 12-page catalog literally takes the motor apart to show how extra protection has been built into the Tri-Clad line of motors. Particular attention is called to the motor's one-piece, cast iron frame and end shield for protection against physical damage; the stator windings of tough Formex wire for protection against electrical breakdown, and the new design of bearings for protection against operating wear and tear.

Other photographs in the catalog show the many types of Tri-Clad motors now available and some typical industrial applications. Copy free upon request.

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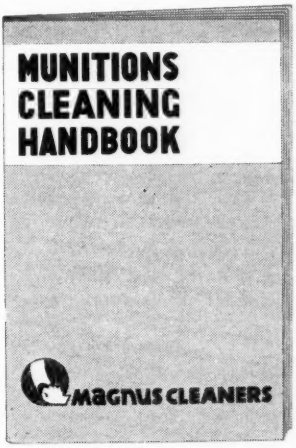
**Magnus Munitions Cleaning Handbook.** The Magnus Chemical Company, Inc., manufacturer of industrial cleaning materials, emulsifying agents and metal-working lubricants, has recently issued a new 36-page, illustrated Munitions Cleaning Handbook.

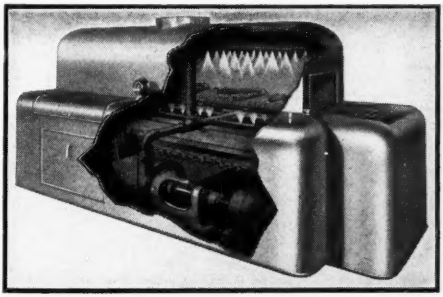
The handbook discusses in detail the




Magnus Munitions Cleaning Handbook

cleaning problems met with in modern munition production. It covers cleaning operations in the manufacture of shells, shell cases, small arms ammunition, and fuses and fuse parts.

Another section of it covers the cleaning operations required in the production of ordnance, transportation equipment and other material which must be built to meet the complex and extensive demands of the Defense Program. The methods and materials discussed in this section are applicable in solving the cleaning problems encountered in any modern metal processing plant.

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Streamlined design. Hidden motors, pumps and pipes are easily assembled. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Monorail, Belt or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

**International Conveyor & Washer Corp.**
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640 E. FORT ST. DETROIT, MICH.

The handbook also devotes space to cleaning in maintenance and repair shops and the cleaning and protection of workers' hands and skin.

Copies of the Magnus Munitions Cleaning Handbook can be obtained by writing to the Magnus Chemical Company, Inc., Dept. M, Garwood, N. J.

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**Newcomb-David Catalog and Handbook of Engineering Data.** The Newcomb-David Company, 5741 Russell St., Detroit, Mich., has issued a new 60-page catalog covering spray booths, drying ovens, metal parts washers, exhaust systems, dust collectors, and miscellaneous sheet metal equipment.

Of particular interest in this catalog is a 28-page section identified as a "Handbook of Sheet Metal Engineering Data." This portion of the catalog provides a compilation, from a number of authoritative sources, of tables, charts and general information which is of value to the engineer or draftsman faced with problems of design, installation, or operation of sheet metal equipment.

Copy free upon request.

**"Ross Industrial Ovens."** This is the title of a 20-page catalog which is now being issued by the J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y. The catalog covers the four following topics: Oven Construction; Method of Heating; Source of Heat; and Material Handling.

The four topics are interrelated, yet each has certain features which are studied independently. With four distinct topics, each having variables, the number of possible combinations is extremely large. It is for this reason that no "standard" oven can exactly suit individual needs, but can at best be only adapted to them.

The J. O. Ross Corporation follows the policy of studying each problem individually and recommending the particular combination of equipment which best fills the need. In the interest of economy, this company has developed certain standard parts or units, and certain methods which may often be applied, and these are used where they are most advantageous.

In this bulletin, the most important factors involved in the above four topics are covered. A copy of this bulletin will be sent free upon request.

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600 ROOMS
600 BATHS

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Room with Bath from $2.50 up

**King Plating Barrel Catalog.** White Oak Machine Woven Plating barrels manufactured and marketed by John King & Sons, 48 Springfield St., Dayton, Ohio, are described in a catalog now being issued by the company. The woven plating barrel does not rattle the work but is said to gently and positively agitate it. The cover is made flat so that in each revolution the work is completely rearranged. The inside contacts can easily be removed, cleaned, and replaced.

Flat work will not cling or stick to the uneven surface of the barrel thereby eliminating all streaks, spots, and burns. A closely woven barrel is provided for small workpieces. An open weave is available for the general run of work.

There are 34 points of agitation in the 16-in. diameter King Plating Barrel. The recommended speed is 1½ to 2 r.p.m.

High caustics and high cyanides with a hot solution does not affect the barrel. According to the manufacturer, a maximum amount of metal can be deposited in a minimum of time. The barrel can be operated with any type of inside and outside contacts.

A copy of this catalog will be sent free upon request.

**Plymouth Laboratories Bulletin.** A bulletin designated as No. 3, Section 1, describing metallic soaps is now being issued by Plymouth Laboratories, Inc., 59 Beekman Street, New York City. This bulletin contains a critical examination of mineral spirits' reactions on a number of aluminum, zinc, magnesium and calcium stearates. This examination, an ageing study over a five months' period, presents in tabular form the state of gelation, dispersion, agglomeration and supernatant liquid observed over this period.

Copy free upon request.

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**"An Island of Quiet in a Roaring Sea of Noise"** is the title of a 16-page booklet published by Burgess Battery Co., Acoustic Division, 536 W. Huron St., Chicago, Ill., illustrating and describing Burgess Acousti-Booths—unique acoustic telephone booths which make telephoning easy in noisy places, such as factories, powerhouses, mills, offices, and so on. Copy free upon request.

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**This Opportunity Section is available for classified advertisements featuring equipment, employment, business opportunities, etc., in the industries devoted to the cleaning, plating, polishing and finishing of metals. For advertising rates and other information address:**

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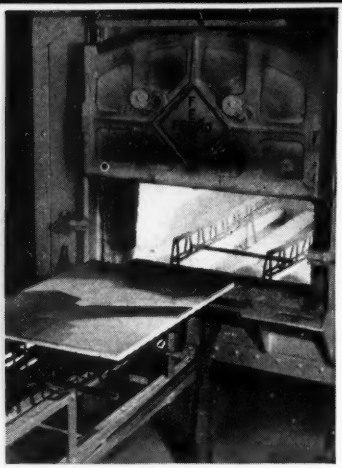

# FOR YOUR Catalog LIBRARY

*To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.*

**1. Newcomb-David Catalog**

A 60-page catalog covering spray booths, industrial ovens, metal parts washers, exhaust systems, ventilating systems, and other sheet metal equipment manufactured by Newcomb-David Company, 5741 Russell St., Detroit, Mich., is now being issued by the company.

**2. Industrial Ovens**

A 20-page catalog covering oven construction, method of heating, source of heat, and material handling is now being issued by J. O. Ross Engineering Corporation, 350 Madison Ave., New York City.

**3. Metal Conditioner and Cleaner**

A corrosion solvent process designated as Corrosol No. 6 for use in protecting metal and prolonging life of paints is described in a folder now being issued by International Rustproof Corporation, 12507 Plover Ave., Cleveland, Ohio.

**4. New Wrinkles in Finishing**

Vol. 3, No. 3 of this publication contains 12 pages of pertinent information on the application of Wrinkle Finishes marketed by New Wrinkle, Inc., Mutual Home Bldg., Dayton, Ohio.

**5. Suporcel Porcelain Metals**

A beautifully illustrated six-page folder explaining the use and application of Suporcel Porcelain Metals is now being issued by Porcelain Metals, Inc., 28 Borden Ave., Long Island City, New York.

**6. Clean Air**

A folder telling how clean air is provided in America's blacked out factories is now being issued by American Air Filter Co., Inc., 254 Central Ave., Louisville, Kentucky.

**7. Glass-Electrode pH Indicator**

An eight-page illustrated catalog describing a new glass-electrode pH indicator is now being issued by Leeds & Northrup Company, 4934 Stenton Ave., Philadelphia, Pennsylvania.

**8. Heavy Duty Buffers**

A 24-page catalog describing Marschke Heavy Duty Grinders and Buffers is now being issued by Vonnegut Moulder Corporation, 1845 Madison Ave., Indianapolis, Indiana.

**9. Oakite Deodorant No. 1**

A triple-action material for use in solving plant sanitation problems is described in a folder now being issued by Oakite Products, Inc., 20 Thames St., New York City.

**10. Pickling Tank Control**

Savings of production time, steam, and acid in pickling operations by means of Foxboro Recording Controller is the subject of a four-page folder now being issued by The Foxboro Company, Foxboro, Massachusetts.

**11. Ten-Lox Stair Treads and Floor Tile**
A four-page illustrated folder showing how Ten-Lox Anti-Slip Treads and Tile can be installed in industrial plants is now being issued by The National Bronze and Aluminum Foundry Company, East 88th and Laisy Ave., Cleveland, Ohio.

**12. Corrosion Solvent Process**
The corrosion solvent process using Metalbond and Corrosol is explained in a catalog which is now being issued by International Rustproof Corporation, 12507 Plover Ave., Cleveland, Ohio.

**13. Finishing Equipment Catalog**
A very complete catalog illustrating and describing finishing equipment of all kinds is now being issued by Industrial Sheet Metal Works, 630 E. Forest Ave., Detroit, Michigan.

**14. General Electric Immersion Heaters**
Bulletin GEA-3195 now being issued by General Electric Company, Schenectady, N. Y., tells how to heat electroplating baths with General Electric Immerson Heaters.

**15. Metal Cleaning Tips**
The chemical classification and selection of alkaline metal cleaners is contained in a bulletin which has been prepared and is now being distributed by the Cowles Detergent Company, 7016 Euclid Ave., C'eveland, Ohio.

**16. Hammond Variable Speed Lathe**
A four-page folder illustrating and describing a method by which speed changes of 1,500 to 3,000 r.p.m. can be obtained instantly on the Hammond VRO Polishing and Buffing Lathe is now being issued by Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Michigan.

**17. Textured Enamel Finish**
An improved textured enamel finish known as Rincontrol is fully illustrated and described in a folder now being issued by Roxalin Flexible Lacquer Co., Inc., Box 713, Elizabeth, New Jersey.

**18. Airway Ventilated Buffs**
Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 20-03 41st Ave., Long Island City, New York.

**19. Heavy Duty Grinders and Buffers**
The complete line of Marschke Heavy Duty Grinders and Buffers manufactured by Vonnegut Moulder Corporation, 1845 Madison Ave., Indianapolis, Ind., is illustrated and described in a 22-page catalog now being issued by the company.

**20. Finishes for Jewelry and Novelties**
Five standard finishes for jewelry and novelties, rhodium, white gold No. 2, Wite brass, and gold smut base finishes are described in a folder which is now being issued by the Alrose Chemical Company, 80 Clifford St., Providence, Rhode Island.

**21. Orvus for Alkaline Cleaning Baths**
All those engaged in metal cleaning operations will be interested in information regarding an alkaline cleaning bath addition agent known as Orvus now being distributed by Procter & Gamble Co., Gwynne Bldg., Cincinnati, Ohio.

**22. Du Pont High Speed Brass**
The Electroplating Division of E. I. du Pont de Nemours & Company, Wilmington, Del., is now issuing a catalog describing an electroplating process for the rapid production of smooth, bright brass deposits.

*Print plainly in filling out coupon for literature.*

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